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The Outlook

Justifying the American Purchases?

FOR every hundred people who criticize this thing or that, there is probably only one who, given the job, could do it better, or even as well. It is also true that, due to the human weakness of wanting to go one better or worse, molehills can be talked into mountains and back again.

Rumours have been circulating about Tudors for some time, and last week the M. of S. saw fit to make a premature public announcement of faults following the return of an Avro Tudor I from a development flight in Africa. Far from alarming us, this statement confirms our faith in the strength of the British aircraft industry and in the importance of the individual manufacturer. That for no essential reason the temporary faults of one proprietary aircraft, learned mainly by hearsay (no official report having yet been submitted) should be thus singled out and publicized seems extraordinary.

Imagine the consequences of such procedure in another industry. Swift action would surely follow should a public figure call together the Press and say that the X car company's roadster had defective steering, vibration in the back axle and a fuel consumption in excess of the figure claimed.

It has been fairly obvious that the whole position regarding large British passenger aircraft is serious, but the blame cannot be laid on the Avro doorstep. The Tudor is now only about eighteen months old. For such a large animal the equivalent of the human period of gestation was remarkably short—shorter in fact than for any counterpart in this or any other country. Adding the period of only another nine months while design was in progress, the total time which has elapsed since the specification was put out is only three years.

Perhaps the greatest fault has been over-enthusiasm on everyone's part. After the war we all wanted to see a new large British airliner in service as soon as possible, and when the Tudor prototype—an empty shell—took off on its maiden flight in June of 1945, it was hailed and publicised as the first answer to our prayers. The time likely to be taken by the development work, interior planning—not to mention pressurizing, of which we had no previous experience—was overlooked.

Making no allowance whatever for the extraordinary times, a year can still elapse before the perfected Tudor I goes into service, and it will still have been produced quickly. There is no use in denying, however, that the new faults revealed during the recent B.O.A.C. trials are both untimely and disappointing. The official statement that these faults were publicised to show that nothing would be spared to ensure safety on British airlines had the odour of a ministerial red herring. While one accepts that certain handling characteristics might not become apparent until the aircraft was tried-out under tropical conditions, others, such as greatly intensified directional instability on the take-off run, might have been expected to reveal themselves at an earlier stage. This sudden manifestation following manufacturers' and Boscombe trials, and after the granting of a C of A is puzzling, to say the least.

More Delay

Development flights by airline companies form a part of the operational testing of all passenger aircraft some time prior to their entry into service. Tudor Is, already late for their first over-optimistic in-service date, will now be delayed at the very least for another three months while cures are found for excessive swing on take-off (not an uncommon fault, in a lesser degree, of most large tail-wheel aircraft); for tail buffeting at fairly high airspeeds, caused chiefly by the ruffled airflow leaving the wing root and inboard engine fairings; and for reduced A.M.P.G. resulting partly from greater drag than had been estimated and also it is said, from a rather higher fuel consumption than was expected from the engines.

Pulsating Jet for Helicopters ?

THE high specific fuel consumption of the pulsating jet in the flying bombs (small as they were, they did only one mile to the gallon of fuel) would cause most engineers to dismiss this type of power plant as of no further interest. Certain American students of the subject, however, appear to think otherwise, and a paper was contributed to a recent meeting of the S.A.E. by Mr. Edelman of Princeton University. He apparently foresees the possibility of reducing fuel consumption and increasing the life of the flap valves.

In the application to rotor drives in helicopters Mr. Edelman sees certain advantages, such as a considerable saving in weight, and reports that helicopter engineers who have studied jets at the blade tips have obtained promising results. They might be arranged either as fairly large single jets at the tips, or a number of small multiple jets.

The advantages of the pulsating jet engine are, of course, quite obvious. It is very simple, the only moving parts being the flap valves, and should thus be cheap to make—no turbine with expensive blading, etc., and no compressor. It is capable of running over a wide range of speeds and, in fact, will operate without forward movement, in which respect it differs from the athodyd, which does not begin to work until a very high forward speed has been reached.

An obvious objection to the use of jets on helicopter rotor blades, and it applies to any form of jet, is that if the fresh air is taken in at the front end of the jet, it will be liable to be mixed with the exhaust from the jet on the blade in front. This could be avoided by scooping in the air near the hub of the rotor and passing it through the rotor blades to the jets, but in that way the ram effect due to the high tip speed would be lost, apart from the extra complications entailed.

That the possibilities of this form of rotor drive have not been overlooked in this country was indicated some time ago when, at a lecture to the Helicopter Association, Mr. Pullin showed some experimental models of jets designed for this specific purpose, but so far no results of the tests have been announced.

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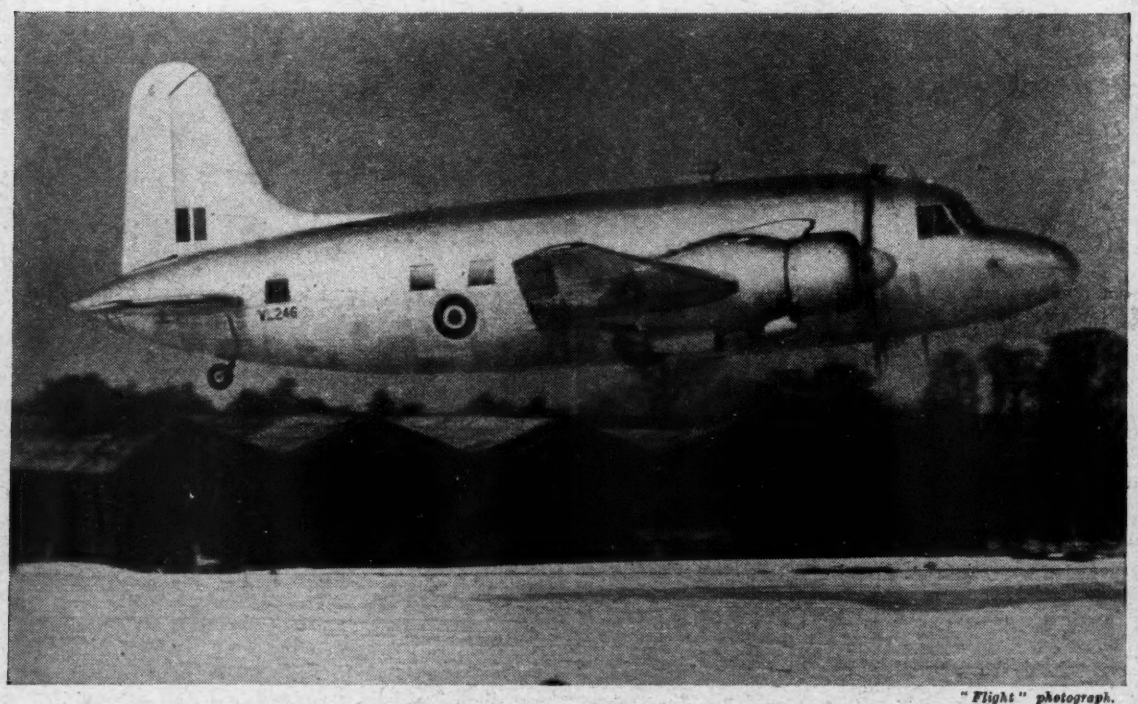
PUBLISHERS' ANNOUNCEMENT

In consequence of the serious position with regard to coal, and in common with all weekly periodicals, it is unlikely that it will be possible to publish the next two issues of "Flight." When power becomes available, publication will be resumed.

The Editorial Offices will remain open in order to deal with enquiries and correspondence.



"Flight" photograph.

TO WARMER CLIMES: The first of the King's Vikings (VL246) arrived at Capetown at 4 p.m. on Sunday, Feb. 9th, having flown the 7,036 miles in 33 hours. It was flown by Capt. S/L. H. F. Payne, D.F.C.; Co-pilot: F/L. P. G. Tilbrook; Navigator: F/L. A. Knapper, A.F.C.; Signals: F/L. D. J. Dartmouth. The other three aircraft of the King's Flight left later.

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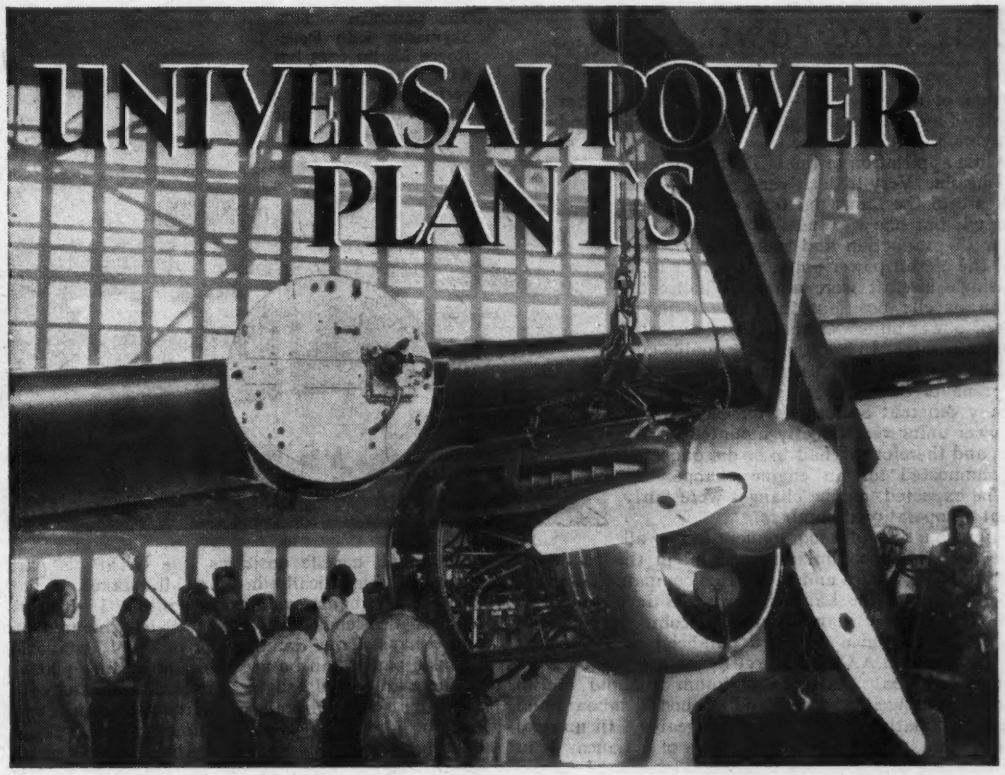

Canadian technicians confer as a Merlin 621 is hoisted up to its D.C.4M bulkhead.

Interchangeability of Engine Type and Position : Wartime Measure Applied to Civil Transports : Provision Against Climatic Extremes

SOME of the highly accelerated development work carried out by the British aircraft industry working at wartime pressure produced results in military aircraft which are well ahead of present civil practices. In some cases we have now, so to speak, to catch up with ourselves and fill-in the intermediate stages. There were, however, many other wartime developments which could be applied at once and almost directly to civil aircraft. The Universal Power Plant is one example.

Most people will know in general terms the purpose of the Universal Power Plant, but they may not know of the many advantages it now offers for civil aircraft. At one time, in pre-war days, the engine manufacturer produced "an engine" and the airframe designer arranged for it to be wrapped up and attached at some convenient point on the airframe. During the late 1930s "power units" were proposed and the first examples produced. This meant that an engine with mounting and cowlings was assembled as a unit from bulkhead forward and presented to the airframe manufacturer for installation, pick-up points and connections having previously been settled. The introduction of the Universal Power Plant was a logical and timely third stage.

Only ten years ago engines were comparatively simple and free from "extras," but while the basic structure of a Merlin 620 differs little in layout or appearance from the first Merlin or, in fact, from the early unsupercharged Kestrel, a great difference can now be seen, particularly at the breathing end where an injection carburettor, a massive supercharger unit with intercooler, and a cluster of accessories and controls have been added. The main components of the in-line engine are now barely visible beneath all this equipment which goes to make up a modern engine.

Installation design quickly became a job for the specialist, and the trans-

All four Merlin 620 power plants are interchangeable on the Avro Tudors. Four-bladed airscrews are used for this installation.

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formation of an engine into a self-contained power unit the work of a department equal in status to those producing the engine and the airframe.

The first application of the U.P.P. was to the Avro Lincoln. Very little adverse criticism was ever heard of the Lancaster from which it was developed, but one weakness, from the points of view of production and maintenance, concerned the Merlin power units. The four units for a single aircraft were not interchangeable between nacelle positions, and the different marks of power units were not interchangeable between aircraft. In addition, the double-curvature panels were not easy to produce and were prone to distortion in service. Finally, the many different accessories for each of the four power units were directly mounted on the engine, and therefore all had to be disconnected and reconnected for an engine change. As would be expected, engine changes were fairly frequent on operational bombers.

The outcome then of a requirement felt by all aircraft and engine manufacturers, and in the particular case of the Rolls-Royce and A. V. Roe companies, a result of experience with the Lancaster was the development of the Universal Power Plant for the Lincoln. Attachment points are spaced on a standard bulkhead to dimensions settled by the S.B.A.C., and accessories are driven from a separate gear box. With the minimum of labour, Merlin units can be changed, and port and starboard, inboard and outboard installations are all interchangeable. In unusual circumstances, to quote the special case of a Lancaster in use as a flying test bed, four different marks of Merlin engine could be fitted in any of the four positions; single- or two-stage Griffons could be substituted for the Merlins; or, finally, radial engines in the same group, conforming to S.B.A.C. dimensions, could be installed.

The Canadian-built Skymaster with Rolls-Royce Merlin 621s has a considerably improved performance. The slight taper of the power plant cowling can be seen.

U.P.P. Installations

Rolls-Royce engines supplied as Universal Power Plants and the aircraft for which they are intended are as follows:

Merlin 65, 68 and 85	..	Lincoln I and II.
,, 100 Series (102)	..	Civil prototype engine for Tudor I.
,, 600 Series (620)	..	Canadian Douglas D.C.4M.
,, ,, ,, (621)	..	Avro Tudor I and II.
Griffon 11, 2-speed	..	Experimental.
,, 61 and 62, 2-speed, 2-stage	.. ..	,,

Main features of the U.P.P. may be listed as follows:—

(a) Circular cowling which is acceptable to all aircraft manufacturers, and which is built-up from single-curvature panels, easy to produce and fit.

(b) Separate gear box for accessories installed in the aircraft independent of the engine.

(c) Standardized bulkhead diameter and pick-up points.

In addition to the main provision of interchangeability between all nacelle positions, the U.P.P. is particularly clean aerodynamically in that all intakes, radiators, air filters and exhaust systems are contained within the cowling. It also lends itself very well to armoured protection and exhaust-flame damping for military installations, and the side panels can be used as maintenance platforms.

There are certain slight drawbacks, but, as with almost every unit of an aircraft, there must be some compromise. For the Merlin the U.P.P. diameter is unnecessarily big, first, because of the size of the bulkhead required for the inboard power plant at the rear of which is the undercarriage assembly, and secondly, because it must be able to accommodate radial engines. Again, the requisite quantity of fire-extinguisher fluid is larger with the pressure cowling type of power plant because of the large air flow over the engine—a measure to meet the exhaust flame damping requirements of the military power unit.

It should be made clear that, although the Merlin 620 power plants for the D.C.4Ms are of U.P.P. type, there are certain distinct differences. The diameter of the standard cowling is 56in, while that for the D.C.4M has to taper from 60in. the size of the original Douglas bulkhead, down to the standard 56in at the front former ring. Other differences include the employment of electric actuators in place of pneumatic ones and the provision of a second air-exit flap to enable the exhaust cowling louvres to be deleted.

Equipment Complete

D.C.4-M Power Plants are very thoroughly prepared to meet extremes of climate, and the size and elaborate equipment of the installation can be said to be commensurate with the services provided. To gain a true picture, a visit to the Rolls-Royce flight-development and testing establishment at Hucknall would be required. It must suffice here to say that every detail has been developed and tested in the various sections of the experimental department, where rigs have been devised to investigate the behaviour of all systems and structures under the most arduous conditions before incorporating them in the power plant.

The Rolls-Royce Company does not hesitate to check and test proprietary equipment used on their civil power plants and at all times to give advice to the manufacturers. The company accepts responsibility for the whole power plant, and rightly points out that the reliability or, more particularly, serviceability of a power plant depends on the trouble-free operation of each component.

So far, these power plants have been described in general terms as a Merlin engine with circular cowling, standardized attach

An interesting example of interchangeability is provided by this Lancaster test bed with Tudor power plants inboard and D.C.4M power plants outboard.

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ment points and a remote gear box for accessories. Details of its various structures and systems follow.

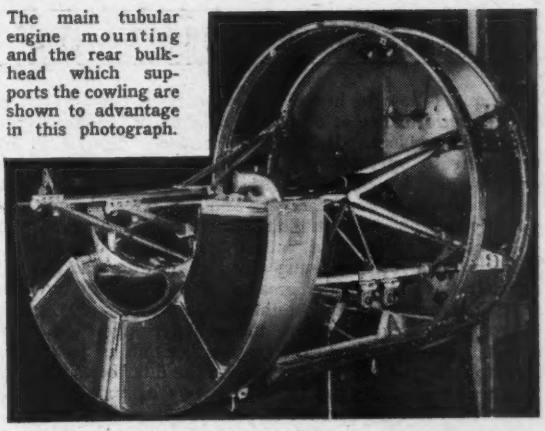
A rigid triangulated engine support of welded steel tubes forms the backbone of the whole power plant. The engine is carried on four feet, of which the front two are secured by fitted bolts and the rear two by bolts which permit movement for thermal expansion. From the forward end of the mounting is slung the beam which supports the radiators.

Much interesting information was brought to light during wartime investigation of engine vibration. Fractures of radiators and exhaust stubs were traced to this cause and cured, in the main by redesign of mountings. The introduction of rubber mountings for radiators has increased their life tenfold.

In America, incidentally, a civil aircraft cannot be granted a C. of A. until the whole airframe has been vibration tested. There has been no similar regulation in this country. It is understood that when the Lincoln was first tested with three-bladed airscrews, excessive vibration occurred, and de-synchronization between engines and airframe was required. Four-bladed airscrews in this case effected a cure. A slight cropping of the airscrew blades removed a similar trouble in Mosquitoes.

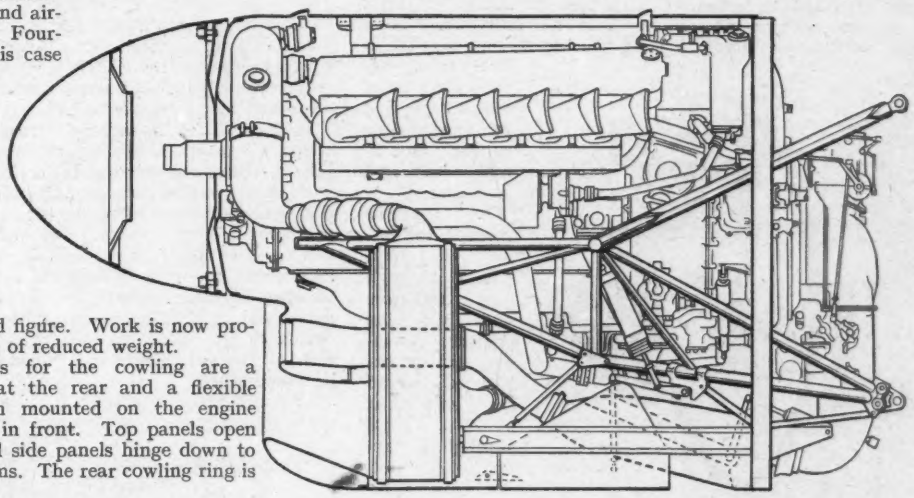
Recent strain-gauge measurements of the engine mounting have shown that the strength safety factor is considerably over the accepted figure. Work is now proceeding on a structure of reduced weight.

The main supports for the cowling are a channel-section ring at the rear and a flexible light-metal diaphragm mounted on the engine reduction gear casing in front. Top panels open like a car bonnet, and side panels hinge down to form servicing platforms. The rear cowling ring is



The main tubular engine mounting and the rear bulkhead which supports the cowling are shown to advantage in this photograph.

designed to lie forward of the main bulkhead so that airframe designers may select the most suitable fore and aft engine position, and it is left to them to provide the



Installation drawing of the Merlin Universal Power Plant. The engine mounting, and the cooling and air-intake systems, have been accentuated.

small pressure-tight panels aft of the cowling ring.

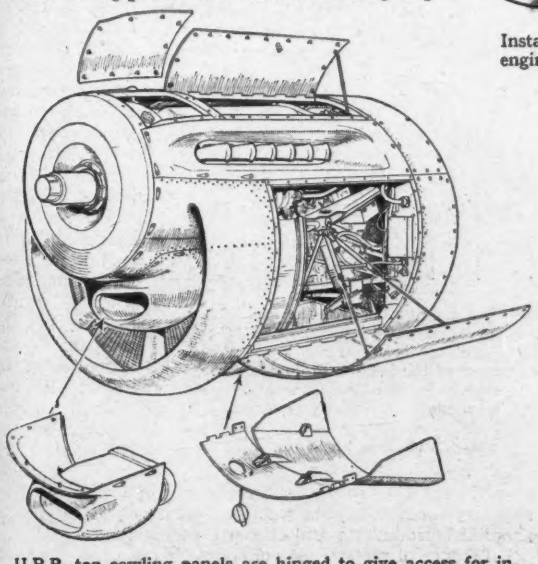
Additional sections are the radiator intake scoop which carries the air-intake fairing, and the lower panel carrying hinges for the cooling flap.

Side, top and bottom panels are made of 10 S.W.G. Duralumin sheet which, incidentally, is sufficient to give some protection against small arms fire and shrapnel. Full armour for military installations calls for the use of 4 mm armour plate with a weight increase of about 160lb per power plant.

The main induction-air intake is placed below the spinner in a forward-facing position, taking full advantage of ram. A duct leads the air back to the supercharger intake, and embodied in the system are a hot-air intake and an air filter.

A two-position forward-facing flap valve has been let into the duct at the point where it passes behind the radiators. With flap in the up position, hot air passing through the radiators is drawn into the engine, and with the pressure cowling outlet closed an intake temperature rise of 65 deg C is possible in conditions of extreme cold.

Air filtration is desirable on transport aircraft, particularly those serving countries with dry climates, in order to avoid the need for engine changes before the established overhaul period With the increase of rated altitudes the



U.P.P. top cowling panels are hinged to give access for inspection and the large side panels can be used as maintenance platforms. The air-intake fairing and exhaust flap are shown separately.

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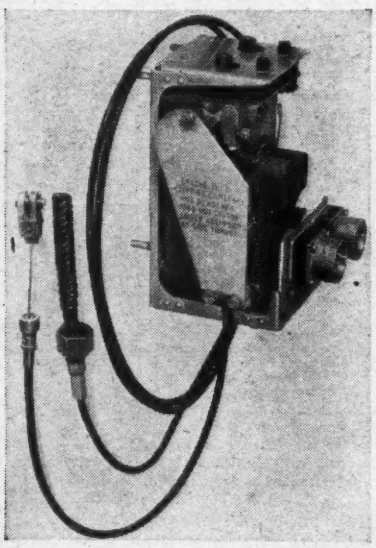
question of how to house a cleaner large enough not to impair performance at operating height has become a considerable problem. It has been met on the U.P.P. by arranging to by-pass the filter after the aircraft has left the ground. A cleaner box assembly is interposed between intake duct and supercharger, and the filter element lies roughly horizontally in it. This element is hinged at this rear end and, on the ground, is swung upwards into filtering position. When it is swung down again after the aircraft has left the ground, the greater portion of sand or dust is shaken from it and lost through holes provided. The filter can be linked up with the undercarriage of the aircraft so that it moves to the by-pass position as the wheels fold up. On the D.C.4M installation the filter box assembly has been removed and a collector box or trap for drain pipes, etc., has been added in place of external outlets.

Radiators

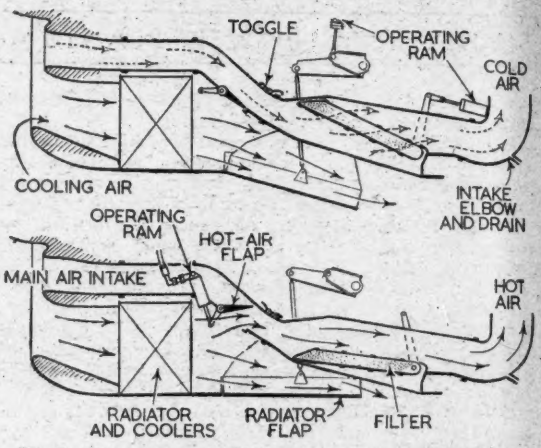
It is in the arrangement of radiators that the main visible difference between the U.P.P. and earlier Merlin power units is seen. The three side-by-side segments of the semi-circular U.P.P. assembly are, port to starboard, main coolant radiator, intercooler, and oil radiators. Their respective areas are 2.75 sq ft, 1.27 sq ft, and 0.75 sq ft. The three are supported from a beam attached through flexible rubber mountings to the engine cradle.



The radiator flap "inching" control unit. The phial for the header tank and the Bowden cable for the follow-up lever are also shown.

Air enters through the forward scoop, passes through the radiators and into the pressure cowling and is exhausted round the exhaust stubs and through a flap-controlled outlet below. This flap is operated by what is known as an "inching" control, and for the normal range of working positions its positioning is automatic. From normal "operating closed" to "fully closed" position it is manually controlled (except on the D.C.4M which is automatic over the whole range). The system also has an automatic emergency override control, and in the event of component failure, a serviceable trailing position is assumed by the flap.

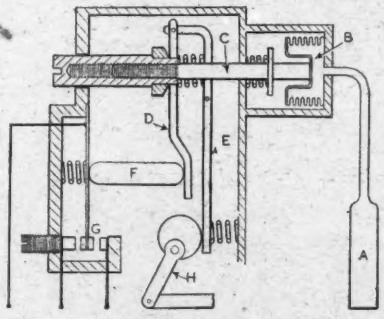
The "inching" control, developed by Teddington Controls, Ltd., is applicable to coolant, oil or cabin air systems and in this particular case holds the Merlin coolant temperature between low and high limits of 105 and 125 deg C. It represents an advance over by-pass thermostats in several respects, and provides much closer control than the earlier two-position "open and normal" type radiator flap controls. Unlike previous systems, the inching control (so called because it is capable of "inching" or moving the air outlet flap in a large number of steps) permits the maintenance of a temperature balance for engine heat output, so providing a flap position of minimum drag for particular running conditions. A later refinement is the provision for "step inching," that is, limitation of flap response to that induced by a suitable predetermined change in temperature, generally about one degree C, thus reducing wear and tear in the actuating mechanism.



Details of the hot and cold air intake and air filter systems are shown in these diagrams. The air flow through the radiators and out through the main outlet flap is also indicated.

In the D.C.4M the inching control unit or thermal switch is located on an anti-vibration mounting. A phial is let into the header tank, and the follow-up arm is connected with the air outlet through a Bowden cable. Very briefly the principle is that in response to changes in coolant temperature, bellows operate a switch arm opening or closing one or other of two electric circuits. These, through either an electric screw or pneumatic actuator, cause the flap to open or close with rise or fall in temperature. The movement of the flap is transmitted back to the thermal switch via the follow-up lever so as to neutralize the movement of the switch arm occasioned by the original change in temperature.

Methods and materials of radiator construction have undergone a number of changes during the last few years. It is interesting that the practices employed in America differ considerably from those in this country. Rolls-Royce engineers are investigating further alternatives. Incidentally, radiators and cooling were the first installation problems tackled by the company on the formation of the Flight Experimental Establishment at Hucknall. The main change-over during the war was from honeycomb to secondary surface (fin and tube) construction, and it resulted in greatly simplified production and startling reductions in price.



The inching control thermal switch in diagrammatic form. A phial; B bellows. C, D and F transmit movement of the bellows to double contact switch G. H follow-up arm and cam responding to flap movement. E lever transmitting cam movement via D and F to break circuit at G.

Difference of materials is, of course, responsible for some of the change in price. In this country copper and 50:50 solder are still the principal ingredients. America and France, however, favour aluminium. American practice

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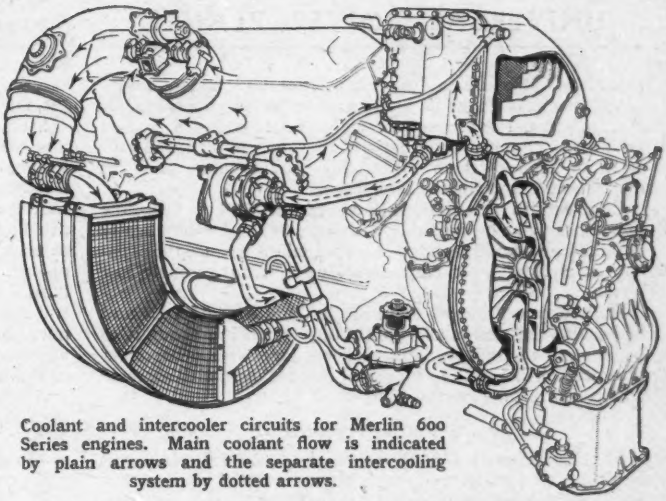
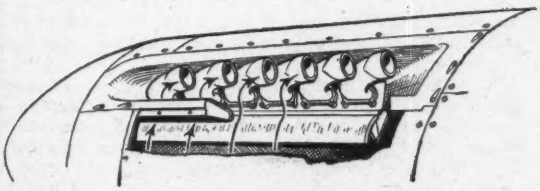
is to expand extruded aluminium tubes into header plates, while in France a secret brazing process has been developed in conjunction with drawn tubes. Several methods are used in this country, based on copper tubes and dipping methods. One technique is to apply a ½ thou. silver skin and then to heat the block in an inert atmosphere.

Some corrosion troubles have been experienced with aluminium radiators used with glycol. A solution may be a completely aluminium system, i.e., aluminium pipes, header tank, etc., in that the electrical potential between copper and aluminium gives high corrosion rates.

In commercial-type aircraft cost and weight are particularly important, and the use of aluminium might result in a major weight saving over existing types of radiator. Honeycomb construction permits a saving in weight, but the liquid content is high, the weight of water per square foot of the frontal area being in the ratio of 15 lb to 5 lb for the secondary-surface type with its small passages.



Coolant and intercooler circuits for Merlin 600 Series engines. Main coolant flow is indicated by plain arrows and the separate intercooling system by dotted arrows.



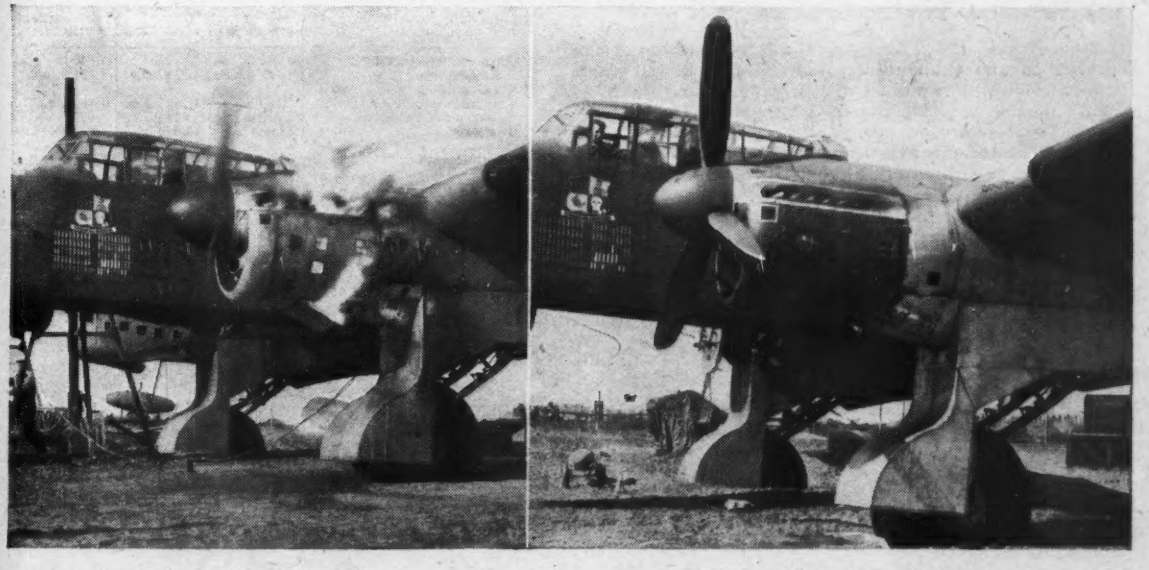
Louvred ejector type exhaust stubs. Air flow from the pressure cowling is indicated by the arrows.

Oil coolers are mostly of the honeycomb type because of the low viscosity of the fluid, and the next stage will probably be a change to aluminium construction. Intercoolers are similar in construction to the main coolant radiators, but brazing is usually employed in place of solder because of the higher temperatures and pressures.

One source of trouble experienced due to bad design of an oil system is frothing. A "hot pot" must be able to separate up to 100 per cent of air from the oil, for on the dive or climb, either the front or rear scavenge pump intake in the engine will be clear of oil. There is normally about 20 per cent of air by volume on the pressure delivery side of the system.

A greater problem is to make provision for the enormous rise in pressure on starting at sub-zero temperatures. From a normal scavenge pressure of about 20 lb/sq in, it may rise momentarily to 200, which is at least 100lb higher than the average oil cooler is built to withstand. The present control valves prove inadequate in extreme cold, and surge valves are now being fitted for countries in which sub-zero starts might be made.

The header tank for the coolant system is somewhat smaller than in earlier installations and carries a thermostatic relief valve and a quick-release filler cap. Because a considerable pressure exists in the system at higher tem-



A retired operational Lancaster is used to test fire extinguishing systems. (Left) A fire is caused in an engine running at full speed and with the slipstream of another Lancaster, standing immediately in front, passing over it. (Right) A few seconds later the airscrew is feathered and the fire successfully extinguished.

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peratures, this cap is designed to prohibit removal under conditions that might be dangerous to the service engineer.

A 30: 70 per cent ethylene-glycol water mixture is used in normal climatic conditions, and separate systems with separate engine-driven circulating pumps are used for main cooling and for the intercooler.

Civil Merlin installations have in the cockpit low-flow indicators which include warning lights automatically switched on should leakage or pump failure reduce the capacity or circulation of engine coolant to a dangerously low level.

Rolls-Royce are now tackling the problem of pipes and hoses and the design of connections which are thought to be in need of improvement to keep pace with other components. A satisfactory all-metal flexible pipe with screwed connection is one of the aims.

Exhaust System

For the original U.P.P. as fitted to the Linclon night bomber, exhaust flame damping was essential and, as has been mentioned, the air-cooled manifolds and fishtails, which project independently from the cylinder blocks into the two louvred exhaust panels, are very efficient in this matter. The exhausts terminate in curved fishtails with ½in slits. Flame damping is achieved in this manner with minimum loss of power due to back pressure, but at the expense of some exhaust thrust.

On civil installations the fishtails were replaced by round stubs to regain thrust, but they proved to be noisy. The answer to the silencing problem may be long pipes carried below the wing and acceptance of loss of thrust and increase of weight, although on the D.C.4M this is impracticable because of the engine position in relation to the leading edge. A modified fishtail may still be used for this installation.

Since a fuel supply failure may stop an engine even more quickly than a mechanical failure, Rolls-Royce have made themselves responsible for testing the whole fuel systems except for the tanks. As with other services, tanks, pumps, filters, lines and cocks are all assembled as an installation on a test rig, and fuel supply is checked in all attitudes and under extreme conditions of temperature and pressure.

Fire Extinguishing

Rolls-Royce, Ltd., have made a special study of fire prevention and extinguishing, and all civil power plants now meet world requirements A multi-bottle system of spray nozzles at strategic points around the engine have proved satisfactory on many full-scale tests conducted at Hucknall. Accompanying illustrations give a good idea of such a test in progress, although the second Lancaster, standing just in front of the burning engine and providing slipstream from its engines at full throttle, is not shown.

Several important changes have taken place among the minor components of the power plants, and in some instances these must also be mentioned as differences between the D.C.4M and Tudor plants.

First, the actuators on the D.C.4M are all of the Rotax and Miles electric screw type because the Canadians believe these are better suited to operation in extreme cold. Engineers at Hucknall support this contention, but believe that the alternative electro-pneumatic rams can be made satisfactory for very low temperatures with the use of suitable natural rubber. T.C.A. require their D.C.4Ms to operate at −40 deg C, and synthetic rubber washers become hard and may cause air leaks at less than −30 deg C. Electric screw actuators are somewhat heavier than pneumatic ones, and must be covered by safety devices to provide automatic opening or closing as appropriate in the event of failure.

Another Canadian modification is the fitting of stainless steel pipes in place of copper ones, which might eventually fatigue and crack. In addition, all plants are to have new semi-rigid ignition conduits of nickel-plated steel. These will give better protection against oil, moisture and vibration, and will improve the appearance considerably.

With oil absorption and fire risks in mind, a new type of flexible pipe is being used which is rubber-covered and asbestos-lagged.

A small engine modification which gives much improved accessibility is the side-mounting for the airscrew C.S.U. An additional advantage of this modification is that it permits the use of a simple rod control in place of a remote system.

The foregoing description will, it is hoped, have indicated something of the enormous amount of thought and research which goes into the preparation of a modern universal power plant. As a result, engines are equipped to meet almost every climatic emergency and are capable of very long running periods before overhaul, followed by only a few hours of aircraft unserviceability for power plant change. The overhaul period for the Merlin engine varies according to the air service on which it is used, and a representative figure is 650 to 750 hours. Many of the accessories and services now have overhaul periods upwards of 1,500 hours.

M. A. S.

DATA SUMMARY

	Merlin 60)	Merlin 620	Merlin 621 (D.C.4M)
Engine weight (net dry) ...	1,700 lb.	1,740 lb	1,740 lb
Take-off power	1,725 b.h.p.	1,725 b.h.p.	1,725 b.h.p.
Max. cruising (at 23,500 ft, consumption 88 g.p.h.) ...	1,160 b.h.p.	1,160 b.h.p.	1,160 b.h.p.
Power plant weight	2,790 lb	2,806 lb	2,830 lb
Diameter	55.8 in	55.8 in	60 — 55.8 in (tapering)
Length overall	83.5 in	83.5 in	84.25 in

NOT SO HOT

SEEKING COLD FACTS: An Fi 103 flying bomb (V-1) on test at "50-below" in Alaska where the U.S.A.A.F. Task Force Frigid is testing modern air equipment, including jet fighters. On the right is a pre-heating unit for the impulse duct power unit

American Newsletter

Airport Overcrowding in Bad Weather : G.C.A. to the Rescue : Douglas Supersonic Design for Navy

By "KIBITZER"

THE first two weeks of January, 1947, gave the United States as a whole, and air transport in particular, its worst weather for some twelve months. Snow, fog, low cloud and icing conditions covered the country, with the result that there were a number of accidents and forced landings by commercial aircraft. Luckily, and due to a high measure of piloting skill, not all of these were fatal. But although the weather was the basic trouble, a secondary cause was that, under such weather conditions, airports could not handle the incoming aircraft, some of which had been flying for several hours and were running short of fuel and irrevocably committed to a landing somewhere soon. Those that had the endurance remained stacked up over their destination or went off to alternate airports miles away.

All of last summer the prophets had been saying that, with the bigger and faster and much increased traffic now operating over the American domestic routes, these troubles would occur. But little was done about it. Now, with deaths and insurance claims as arguments, the paying public may demand that the authorities borrow G.C.A. units from the Services, install them at the major airports, and train the crews. The Army is said to have some 130 Mark II sets in storage which could be made available.

Quietly, and without fuss, both the Army and the Navy have been using G.C.A. on their domestic operations—and saving lives, time and expense by so doing. But the airline pilots, even when they have been caught out by weather, do not seem to have tried to use such facilities, despite the fact that they are installed at a few of the larger military airfields throughout the country. It is possible that the crews did not know that they were available, but it seems that the average commercial pilot distrusts aids which are operated almost entirely from the ground, and which are outside his control, preferring to rely on his cockpit instruments and his radio. Such thinking, however natural, is dangerous, and the only way to overcome it is to show pilots what a G.C.A. unit can really do, and give them adequate training in its use.

There are plenty of examples of the efficiency of this method to be found over here to-day. The Army has brought its Air Transport Command machines into airports on the east coast with ceilings of 200 to 400ft and quarter-mile to almost zero visibility, while the Navy at Patuxent has an equally good record with its Naval Air Transport Service. At the time of the fatal crashes at Shanghai on Christmas Eve the Navy is said to have talked-down two of their own transports, and a commercial machine as well, under weather conditions identical with those that caused the other accidents. The fact that G.C.A. units can be had (if the authorities will instal them and the pilots use them) should lead to an early adoption of this method of control. Unfortunately they will be too late for the bad weather due between now and the end of April, but there will be time to train the crews before the winter of 1947-1948.

DOUGLAS DETAILS

MOST of the industry here knew that Douglas were working on a private-owner aircraft, and it was generally believed that this would be a small twin-engine executive type. Details now released indicate that this is a smaller machine than was expected, and will be called the Cloudster. Tests are going on as this is being written and photographs (*Flight*, January 16, 1947) show a most interesting tricycle undercarriage design, with a single airscrew behind the tail, driven by two two-fifty h.p. Continental engines which can be engaged or disengaged at will. These are installed behind the cabin, enclosed in the body of the aircraft, with air scoops for cooling on each side of the fuselage. Moreover, the ease of entry and excellent visibility for both pilot and passenger will give this machine a wide appeal. Span is 39ft 9in, and seating is for five people, plus 2,500 lb of baggage. The climb on two engines is 1,500ft per minute, with a service ceiling on one engine of 11,800ft, or 22,000ft on two. If the range of 950 miles at 200 miles per hour is fulfilled, and the price is right, it should sell. The figure mentioned is about $30,000.

Details have also been released of one of the Douglas Supersonic designs, the D.558. This is powered by a T.C. 180 axial-flow jet engine designed to give 4,000 lb static thrust. The first prototype will have wings of low aspect ratio, set rather far back on the fuselage, the front portion of which, containing the pilot, is entirely jettisonable in case of emergency. This machine, designed for load factors of 18, is a U.S. Navy project.

FEEDER-LINE TYPES

THE news that Boeing had abandoned the development of their 417 feeder line transport was sandwiched in between two contradictory announcements by Lockheed about the Saturn. The first that they had not entirely shelved it after all, the second that they had! This "now you see it, now you don't," policy over these much-discussed feeder line types is a little mysterious, as neither constructor would abandon, or resume, work on new machines unless he had good and sufficient cause. Nobody seems to know whether the reasons for the final decisions were financial, aerodynamic, or mechanical, but Boeing announced that they were not going ahead because they did not think there was a big enough market, and Lockheed said first that they were considering the renewal of the Saturn production because they could get Wright engines which were satisfactory for this particular machine, and subsequently that they could not get the engines after all and that, anyway, they did not wish to spend that much money on a machine which might not have a good enough market.

Presumably, therefore, both machines are now abandoned, so that apart from the Beechcraft D.18s. there is nothing in production here to fill this very important gap. At some time in the future the new four-engined, twin-airscrew Beechcraft 34, said to have Lycoming engines in pairs in each wing, will make an appearance, but it is still some way off. This machine is to be a 20-seater, cruising at 220 m.p.h., but until it arrives feeder-line transport aircraft are more or less non-existent here, unless the Northrop freighter, the Pioneer, is included. This lack is rather surprising, for there must be business—particularly intra-State business—for machines of this class, to say nothing of the vitally important foreign markets which are undoubtedly ready for such a type. If nobody here is going after them, however, it will be a break for de Havillands, Cunliffe-Owen, Percivals, and other English manufacturers who are producing such machines.

AFTER-SALES SERVICE

NOW that the rush of new light aircraft is over and there is no longer the emphasis on production that there was, attention is turning more and more to the service which the manufacturer must give to his client. The stiff competition of this coming summer will high-light this, and as a start the Continental Motor Corporation have announced a re-manufactured engine plan. Under this it

AMERICAN NEWSLETTER

is possible to get from them, by return of post so to speak, a rebuilt engine which includes all the latest modifications, supplied at a predetermined price. All the owner has to do is to take his unserviceable engine out and install the rebuilt one. Thus no time is lost. The engine he has removed goes back to the manufacturer and is, in turn, overhauled and brought up to date and made ready to go out to some other owner. These overhauled engines carry a factory guarantee, and Continentals say that the final cost to the owner is less than it would be if he overhauled and brought his old engine up to date.

Service schemes similar to this will almost certainly be extended by other engine and aircraft builders, and if we are to hold our place in overseas markets we might do well to study them and see if we cannot do something better. The present satisfactory export situation, in which we seem to have held our position in the foreign markets, reflects very great credit on the British manufacturers, the S.B.A.C. and the civil air attachés in the various countries, but this very fact will, before long, increase the competition from over here, and the word "service" will mean a great deal more in the future than it does now. The fact that the great percentage of American exports have so far been surplus aircraft has scarcely encouraged the manufacturer to spend time and money servicing machines which they consider to be obsolete, but it will be a different story when their post-war types reach the overseas markets.

A Profitable Discussion

Air Marshal Sir Ralph Cochrane's Paper Evokes Pointed Comment

POINTS raised during the discussion of Air Marshal the Hon. Sir Ralph Cochrane's paper dealing with war-time air transport (see last week's issue of *Flight*) were in keeping with the informative nature of the lecture.

Sir Frederick Handley Page, in the Chair, introduced the author who, he said, as A.O. C.-in-C., Transport Command, had turned the sword into ploughshares.

Dr. Gold (*D.D.M.C.*) emphasized the difference between weather being a primary cause of accidents and weather forecasts being wrong. During 1946 there had been no accidents due to wrong weather information on civil airlines for which the British Meteorological Service was responsible for giving information. Dr. Gold emphasized this statement because there was so much misapprehension in people's minds concerning the matter.

An officer had recently devized a method of deciding on the best course for an Atlantic flight. In respect of a flight which, by taking a "single-heading" course, would occupy 15 hours, he was able to compute a course which would occupy two or three hours less. The officer believed that the method could be perfected. That was one of the ways in which meterology could contribute very effectively to economy, important to all forms of aviation.

A. V.-M. Collier (*Ministry of Civil Aviation*), agreed with the author in advocating long range, thereby avoiding all the small ground organizations, which cost so much and which meant so much forecasting and planning and communications. It seemed to him that, as we went ahead with civil aviation, we should be compelled for economic reasons to plan long-range operations and to order aircraft accordingly.

Icing and Loading

Major R. H. Mayo asked for information on the seriousness of icing. Another question, which he hesitated to raise in the presence of the Chief Inspector of Accidents, was whether the overloading of aircraft in Transport Command, which was a military necessity, had resulted in an appreciable number of accidents. We had heard a great deal recently about the all-up weight of a certain machine, and he wished to know whether, in Transport Command, because of military necessity, the risks had to be faced, or whether the aircraft could really operate at overloads without serious trouble.

Sir Ralph Cochrane replied that B.E.A. services (Dakotas) ran throughout last winter on many days for which icing was forecast, not once did they experience any serious difficulties. In Transport Command the Dakota was loaded to 30,000 lb-31,000 lb. So far as he was aware there was no accident at take-off attributable to the loading. The risk of engine cut-out at take-off was very small.

Sir W. Welsh felt sure that there were records in B.O.A.C. which would indicate how many transatlantic aircraft had been diverted or turned back due to icing or whose departure had been postponed due to this cause. One would hate to suggest, he said, that icing was not a problem and that we should give up trying to solve it.

A. Cdre. Vernon Brown quoted the case of an accident which pointed to icing as the cause. A structural failure had occurred to a certain type of aircraft, and there was a crash. Whilst one of his Inspectors was groping around the wreckage a farm labourer had come along and had said that, when working about 200 yards away at the time of the accident, something had whistled past his head and had buried itself in the ground. Thinking that it might be important, he had dug it out and had found it to be a piece of ice about 2ft 6in long, one side of it being in the shape of a perfect curve. If that had not been found it would have been difficult to say that the pilot had lost control on account of icing.

Air Marshal Sir Alec Coryton commented upon the author's reference to fatigue on the part of aircrews being due largely to the jungle of instruments which had to be watched, and to the terific waste of manpower in connection with instrument maintenance. The simple solution, he said, was to get rid of them; he would like to see the formation of some sort of League which would go all-out for simplification.

Mr. I. Bowen (*Ministry of Supply*) said that as one responsible for instrument design he had hoped this year would have brought some respite from the demands of the Air Staff for more and more instruments. Unfortunately, during the last months, demands had been received at the Ministry of Supply for six new types. A serious disclosure made in the Transport Command records was that, apart from those instruments and electrical items which were subject to special remedial action on account of abnormal defect rate, the performance was gradually but consistently deteriorating, and that would seem inevitable under a system whereby equipment, unlike airframe and engines, was permitted to fly on without overhaul or replacement at stated periods.

A. V.-M. J. N. Boothman pointed out that whereas the aircrews in the rest of the R.A.F. were ordered, whilst in the air, to make diversions, and had to go and return when and where they were told, the crews in Transport Command made up their own minds to a certain extent.

Mr. F. Radcliffe (*Handley Page, Ltd.*) said Sir Ralph's insistence on attention to cockpit drill would appear to have been underlined several times recently by accidents to civil air liners. The complications of a modern flight deck were a headache to both designer and operator, and we had not by any means reached finality. Pressurization, with which Transport Command fortunately was not involved, was now presenting quite a formidable addition. How important it was, therefore, that we should make a vigorous attack on all duplicated equipment in aircraft, because we had not reached international agreement.

Dealing with a point made by Mr. Radcliffe concerning the forwarding of progress information by Transport Command to the civil operating companies, Sir Ralph said that copies of all Transport Command's Summaries went to engine manufacturers. Further, a civil officer from the B.O.A.C. was given facilities to see all the papers in Transport Command.

Mr. E. N. Rowe said that during a flight from Blackbushe to Prestwick on one occasion the aircraft was strained, yet it was thought fit to go back through very bumpy conditions.

The President, winding up the discussion, said that he was much impressed by the record which had been given of the great growth of traffic at a time when the people concerned must have already experienced many years of strain and when resources must have been very severely strained; the low accident rate, in spite of a vast increase of traffic, was amazing.

Urging that there should be powers to prevent people writing about the cause of an accident on the day after it had happened, giving their reasoning, and so forth, he said it had been put to him recently that it was not right that, for purely commercial considerations, machines were being flown with loads far in excess of those at which they were safe to fly. That arose from writings in the newspapers, from a purely *ex parte* statement by a newspaper man.

HERE AND THERE

The Impatient Pirate

THE U.S. Navy's prototype Vought Pirate jet fighter has been flown from Connecticut to Muroc Dry Lake, California. Lest this should be construed as some sort of unofficial record it must be mentioned that the machine was stowed in two Fairchild Packet freighters.

From Chase to Crest

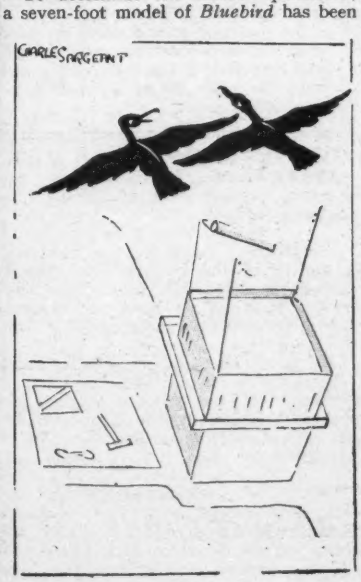
ANY curator, sportsman or legatee having a superfluous moose-head is invited to get in touch with W/C. Rowan Robertson, O.C. No. 242 Squadron, R.A.F. Oakington. A moose-head figures in the Squadron crest and the taxidermal trophy is needed for the Mess. Prospective donors may care to know that "242" has an enviable record in Transport Command and is now equipped with Yorks.

Goblin-powered "Bluebird"

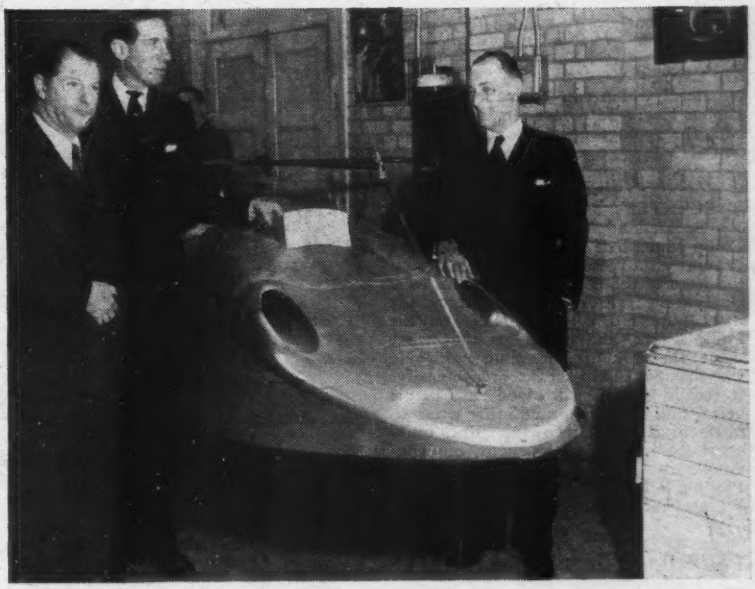
FOR his attempt in the spring to break his own world's water speed record of 141.7 m.p.h., Sir Malcolm Campbell will be using a de Havilland Goblin II in his famous boat *Bluebird*.

At very high speeds of this order aerodynamic problems will supersede hydrodynamic factors, particularly as no under-water shafting or propeller is entailed.

To determine the various quantities, a seven-foot model of *Bluebird* has been tested in the Fairey Aviation Co.'s wind tunnel, and, as a result of this, Vospers, Ltd., designers and constructors of the boat, have been enabled to carry out the necessary modifications.



"Claw trouble my dear"



WIND AND WATER: Here is Sir Malcolm Campbell (extreme right) with the test model of *Bluebird* (see adjoining text) at the Fairey works. Left and centre are Major Frank Halford, the Goblin's designer, and Cdr. Peter du Cane of Vospers Ltd.

Comparative Thrusts

THE Goblin II has a static thrust rating of 3,000 lb for a weight of 1,500 lb, and in the light of this it is of interest that the maximum thrust developed by the propeller at the record speed of 141 m.p.h. was approximately 2,200 lb.

It is calculated that, at maximum speed, the gas speed of the jet effluent will be about 1,000 m.p.h., whilst the air consumption will approximate to 800 cu ft/sec.

The shaft h.p. delivered by the turbine will be between six and seven thousand.

Greeks at Luton

ARISING out of a visit by the Chief Technical Officer of the Greek Air Ministry to the Percival Stand at the Paris Show, a Royal Greek Air Force Mission visited Luton on February 4th to study the Prentice trainer. The party, consisting of W/C. S. A. Valvis, S/L. H. Papafragas and F/L. Fragoyiannis, was accompanied by Mr. H. B. Bentley, who was technical manager at the State Aircraft Factory, Athens, for the ten years between 1928 and 1938.

Air Survey Conference

REPRESENTATIVES from Africa, Australia, Canada and New Zealand have arrived in London by air during the present week for the Empire Air Survey Conference organized by the London company of the Hunting Aerosurveys Group. Each visitor is the managing director of a firm in the Hunting group in his own country.

Lasting ten days, this conference is being leavened by a programme of visits and entertainment which began last Monday with a visit to the exhibition of air survey work and equipment staged at the Hunting laboratories at Elstree Way.

An air trip to Switzerland has also been arranged for Dominion representatives who wish to visit Wild's Map-making Instrument factory as a grand finale to their conference.

Aerial Relief

WITHOUT delving protractedly into official records, we can't be dogmatic about it, but we should certainly imagine that this winter has produced the most severe conditions of frost and snow ever known in Britain. Certainly we do not recall ever reading so many reports of towns and villages cut off by snowdrifts.

Nor can we recall any previous occasion when snowbound inhabitants have had to be provisioned by air in this country, as happened last week, when supplies were dropped by an Anson from the Empire Air Armament School, Manby, to the R.A.F. men at Stenigot wireless station, some 20 miles north-east of Lincoln, while two other R.A.F. stations in Lincs, Elsham and Binbrook, were fed from a Dakota by parachute after three days' isolation. A number of marooned villages near Scarborough were similarly supplied.

Margin for Error

SIR BEN LOCKSPEISER hit the nail on the head when he told Bedford Chamber of Commerce last week that before the average man could take to the air as he took to the road he would have to have some kind of machine in which he could make a number of mistakes before he broke his neck, and that the helicopter had not yet quite reached that degree of safety.

Of course one *can* break one's neck by a single mistake with a motor car if it's that sort of blunder, but with any kind of aircraft, as we know them at present, there are far more of "that sort of

HERE AND THERE

blunder" which can be made. As the famous Harry Tate once remarked, "It's not the going up; it's the coming down!"

Sir Philip tells France

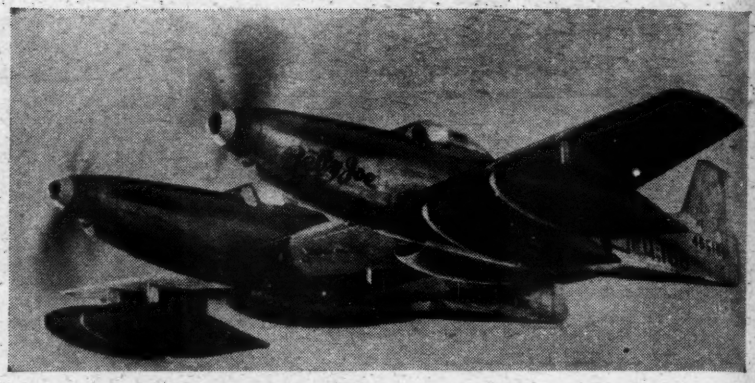
RECENTLY, on his way home from Switzerland, Air Chief Marshal Sir Philip Joubert de la Ferté spoke in Paris to representatives of the French Press on the work of the R.A.F. in the recnt war. Our excellent French contemporary *Les Ailes* publishes a long article on Sir Philip's talk, and comments that what made the talk all the more enjoyable was that Sir Philip speaks French easily. It recalls that French blood runs in his veins, and that his grandfather came to settle in England in 1830. But, quite apart from this little sidelight, our contemporary appears to consider Sir Philip's talk something of a masterpiece. We are not in the least surprised.

Great Heights

HOW the Northern Heights Model Flying Club has grown from very small beginnings on Parliament Hill to a present membership of 1,000 emerged from the speeches at the dinner and dance held in London on February 8th. Not only has the club done outstandingly well in competitions, but with Dr. A. P. Thurston as president and Mrs. Thurston as vice-president, it has achieved a solidarity rarely equalled. That is not to say it has always seen eye to eye with the S.M.A.E., but its views are sincerely held and fearlessly voiced.

Representatives of several other model clubs were present at Saturday's gathering, and A. Cdre. Titmas brought a number of apprentices from Halton. Numerous prizes and cups were presented by Mrs. Titmas, and an album was presented to Dr. and Mrs. Thurston with pictures from last summer's gala day at Langley, when the visitors numbered no fewer than 12,500. The post-war revival of this event was in danger until Dr. Thurston persuaded Mr. Philip Lucas to lend the Hawker airfield at Langley.

BRAB. BRIEFING: Mr. A. E. Russell, chief designer, Aircraft Division (right) with W. G. Morgan and F. H. Pollicutt at the daily conference on the progress on the Bristol Brabazon I.



MONSTROUS MUSTANG: Four 250-gallon drop tanks add to the "Lost Week-end" effect of this P-82 Double Mustang, with which it is intended to fly non-stop from Honolulu to New York (5,000 miles).

News in Brief

A NEW type of compass, said to be no larger than a flashlight, has been developed by that well-known American concern the Minneapolis Honeywell Regulator Company. It is called the electron gun compass, and was demonstrated to the annual general meeting of the American Institute of Electrical Engineers. *Multum in parvo* would appear to be particularly applicable to this development.

* * *

The Colleges of Aeronautical and Automobile Engineering have arranged a dance for past and present students in the South Hall Suite, Victoria House, Bloomsbury Square, W.C.1, on Wednesday, February 19th. Tickets at 5s each are obtainable from the secretary, College House, 72, Princes Way, Wimbledon Park, S.W.19.

* * *

A comprehensive range of their air, oil and fuel filters is being exhibited by Vokes, Ltd., at the Bristol showrooms in Piccadilly from February 17th to 28th inclusive. The exhibition will be open to the public at 2.30 on the first day, and on subsequent days from 9 to 1 and 2 to 6. It will not be open on Saturdays and Sundays. An engineer will be in attendance to supply technical information.

* * *

After recovery from wounds received in Tunisia, Mr. Alex Duncan has rejoined R. K. Dundas and is now manager of the aviation division at 4, St. James's Street, London. Mr. A. E. Bristow has relinquished his post as assistant manager to take up another appointment, and is succeeded by Lt. (A.) C. J. Penfold, R.N.V.R. Apart from brisk business in Austers, the firm has recently delivered their first Airspeed Consul to Patrick-Duval Aviation, Ltd., for operation from Elmdon, Birmingham.

* * *

Electric and General Industrial Trusts, Ltd., of which Mr. C. W. Hayward is chairman and managing director, have bought the entire share capital of Simmonds Aerocessories, Ltd., and Simmonds Products, Ltd., headed by Sir Oliver Simmonds. Sir Oliver retains his interests in Simmonds Development Corp., Ltd. B.O.A.C. has taken over the Aerocessories works on the Great West Road, and the latter concern has moved to the Treforest factory, Cardiff.

THE ROYAL TOUR

Special 4-Page Feature in Colour

AN attractive coloured supplement is included in this issue of "FLIGHT" giving details and views of the Interiors of Vikings of the King's Flight.

Designed and printed ready for inclusion in an issue most nearly coinciding with the arrival of the Royal Family in South Africa, the feature is embodied in the present number.

Mr. G. Geoffrey Smith, M.B.E., editorial director of *Flight*, has been elected 1947 president of the Circle of Aviation Writers.

* * *

Pickering & Sons, Ltd., of Hinckley, claim to be the first printing firm in Britain to use a light aircraft for business travel. They have an Autocrat which is flown by a member of the firm.

* * *

A dynamometer and refrigeration building is being constructed by Pratt & Whitney to test aircraft engines developed for high-altitude flight involving operation at temperatures down to 70 degrees below zero.

* * *

Mr. W. V. Hodgson, who has resigned his directorships with B.S.A. Tools, Ltd., and Burton Griffiths Co., Ltd., has been appointed London area manager for A. C. Wickman, Ltd., Coventry. He succeeds Mr. J. M. Morris who has resigned.

LODGE

Sintox Insulated AVIATION PLUGS

are fitted by

Alvis
Armstrong Siddeley
Bristol
De Havilland
Rolls-Royce

Lodge Plugs Ltd., Rugby.

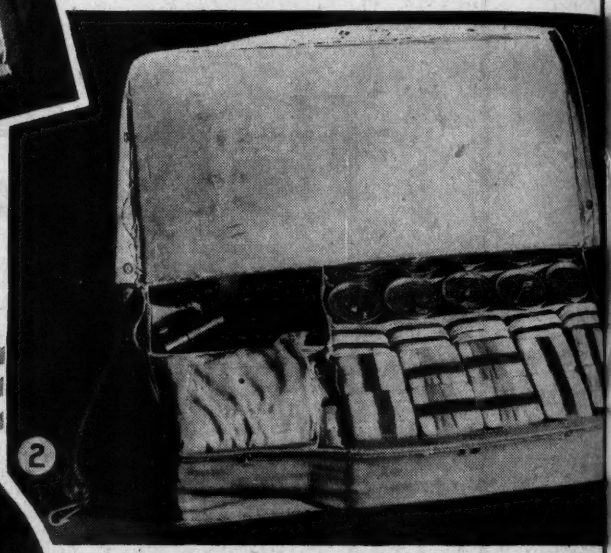
Emergency Equ

Double-tube Dinghies Carried on B

Rations and Water for 5 Days

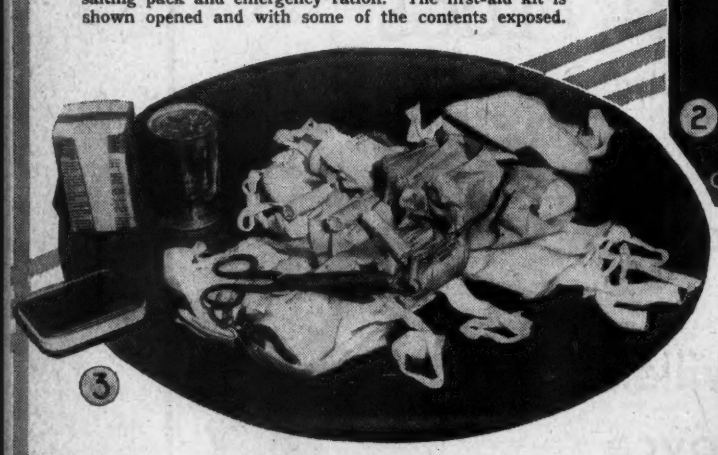
Radio Rescue Aids

1. The emergency pack and radio set ready for stowage. The 18in rule gives an idea of their size.

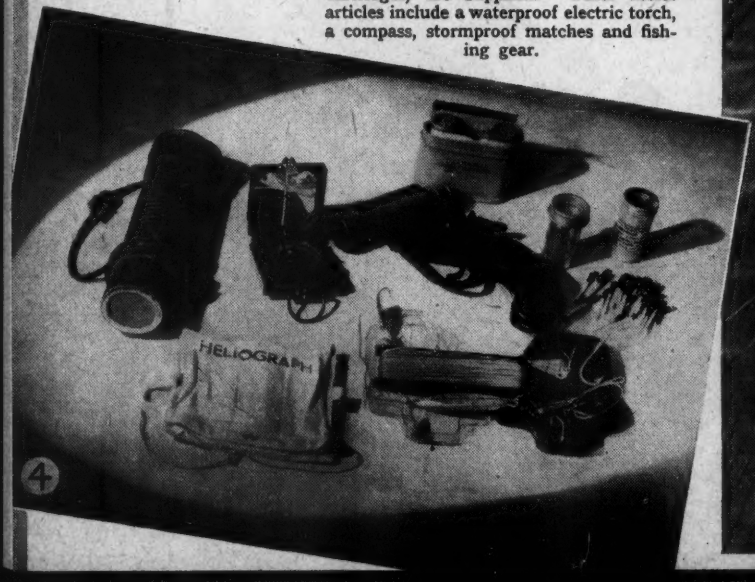


2. Rations for ten persons, a first-aid kit and sundry aids t and survival are included in the emergency pack.

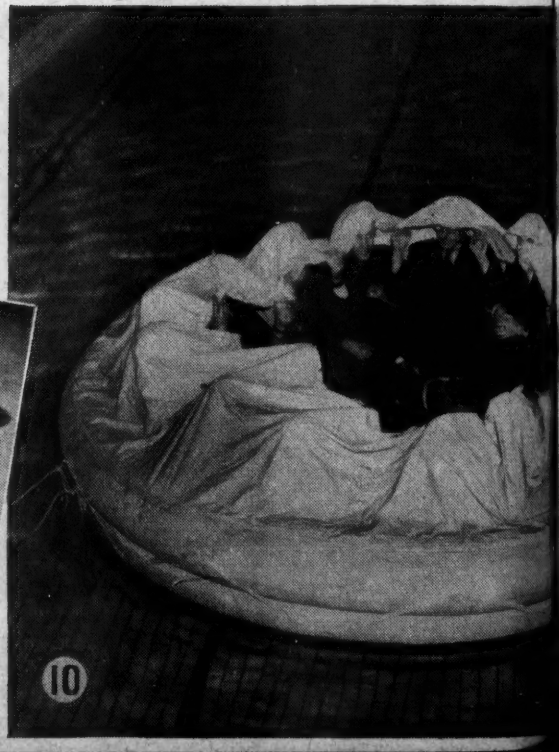
3. Sufficient water and food for one person for about five days is contained in the tin of fresh water, the de-salting pack and emergency ration. The first-aid kit is shown opened and with some of the contents exposed.



4. For signalling, a heliograph and a Very pistol, with an ample quantity of cartridges, are supplied. Other useful articles include a waterproof electric torch, a compass, stormproof matches and fishing gear.



10. A dinghy on the water, with fifteen occ covered by the storm protector.

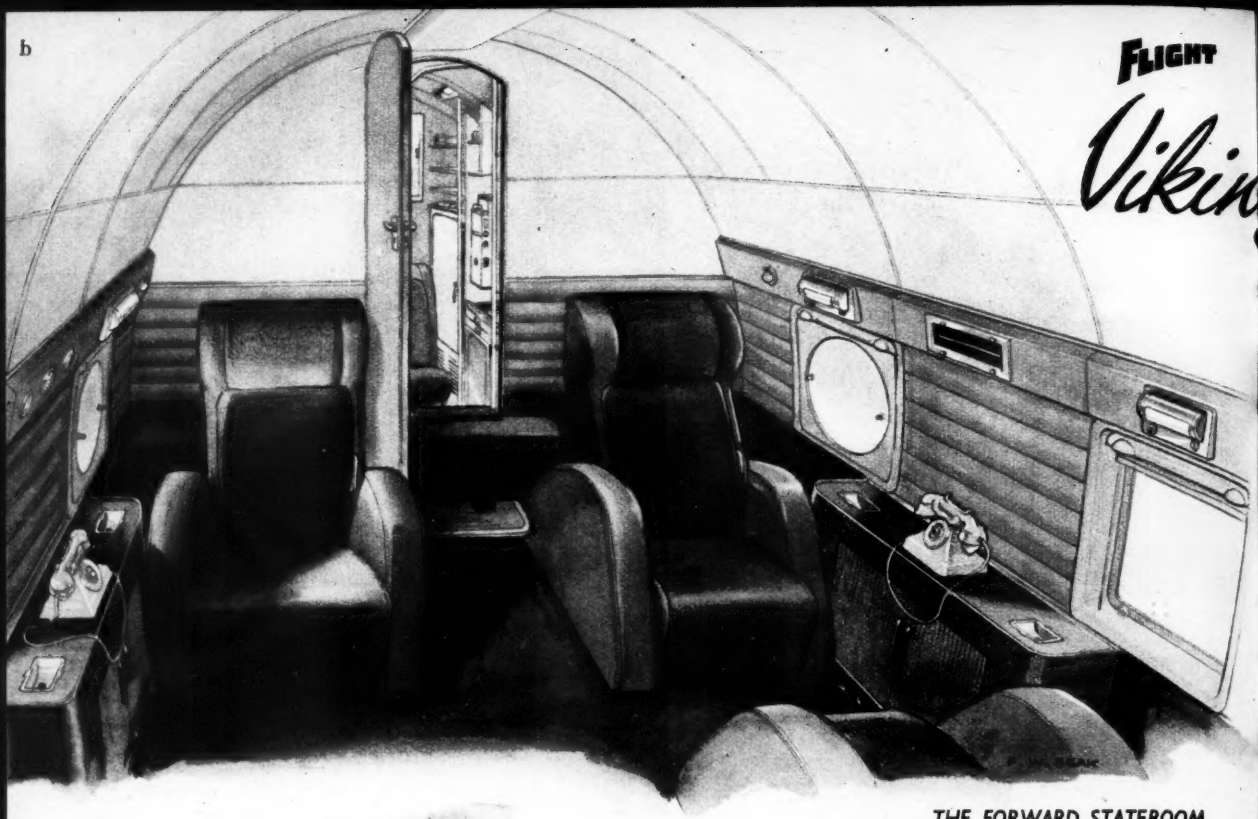


The ROYAL TOUR

ON THIS OCCASION of Their Majesties' tour of the Union of South Africa and Southern Rhodesia the earnest good wishes and homage of every loyal subject attends them.

The Royal decision to utilize aircraft for personal travel while abroad is both a happy choice and a notable precedent which cannot fail to react beneficially on civil aviation generally. Not only is this the first occasion upon which the King and his family have flown together, but it is also the first time aircraft have been commissioned for State use on a Royal journey abroad. Thus on air transport is conferred a degree of usage by Royalty, hitherto confined to other modes of travel.

Viking



THE FORWARD STATEROOM

THE COMMODORE'S OFFICE

THE Royal Tour in South Africa and Southern Rhodesia at present in progress is the first occasion on which aircraft have attended the Royal Family on a comparable basis with surface transport, and it is a worthy tribute to Vickers-Armstrongs that Vikings should have been chosen for this responsible duty. We mark the event, which is of real significance to aviation, by giving this survey of the Royal aircraft in full colour.

Two of the Vikings have been identically furnished and decorated for the separate use of the King and Queen; a third aircraft—a standard Viking—is a staff machine, and the fourth is equipped as a workshop to act, in effect, as a flying maintenance unit.

The scheme of interior decoration carried out in the two Royal aircraft has been evolved and executed entirely by Vickers themselves, and as an example of design, both in colour and form, it is distinguished by an extremely high standard. The décor is quiet and restrained yet remarkably effective in its unobtrusive contrast of light and dark shades, the fundamental colours being blue and beige.

In no sense does one get the impression when examining these aircraft that their furnishing is overtly luxurious. Certainly they are very comfortable, and the quality of appointment is immaculate, but the interior treatment is one of subdued elegance and quiet comfort rather than of sheer luxury.

Accommodation Plan

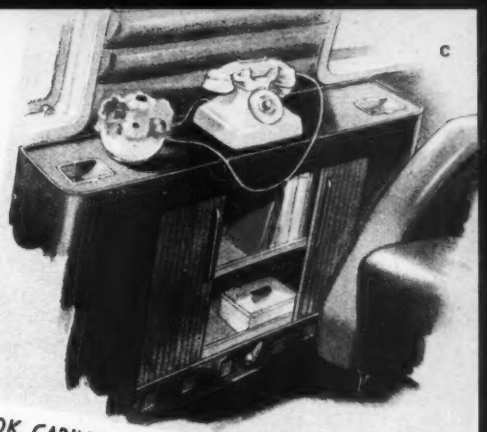
The main fuselage volume is taken up by two staterooms, each accommodating four armchairs, arranged in facing pairs on both sides of a central aisle; but before going on to describe in detail the interior appointment of the staterooms it may be of advantage first to run through the accommodation plan of the aircraft.

A control cabin of larger dimensions than in the normal Viking practice has been installed in order to make provision for a navigator and to permit incorporation of the extra radio and radar equipment which is carried. A toilet compartment is included in the flight deck, this being on the starboard side, rearward of the radio operator and opposite the navigator, whose station is on the port side. A door in the after half-bulkhead leads from the control cabin into the commodore's office.

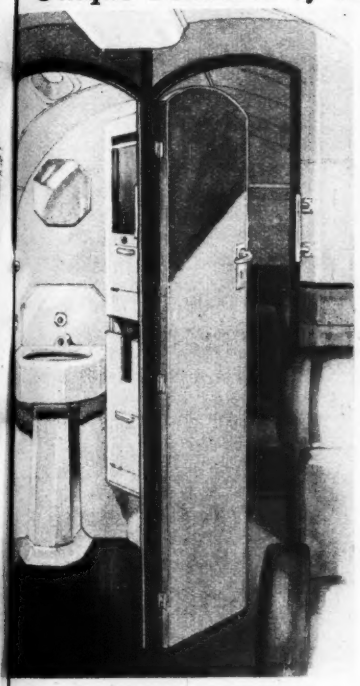
Each Royal aircraft is under the governorship of a commodore, to whom the pilot is responsible, and in whom, under the Captain of the King's Flight, the control and organization of the aircraft is vested. The commodore sits facing rearward at a desk fitted on the front face of the bulkhead dividing his office—and the galley, to starboard—from the forward stateroom. This bulkhead is mounted on the casing

...kin of the King's Flight

...s of Interior Appointment and Décor: Unique Features of the Royal Aircraft



BOOK CABINET WITH HOUSE-PHONE



...ILET AND ENTRY VESTIBULE

of the main wing spar, steps on each side affording easy passage through the doorway. A curtain of fawn double-sided velvet divides the galley from the commodore's office.

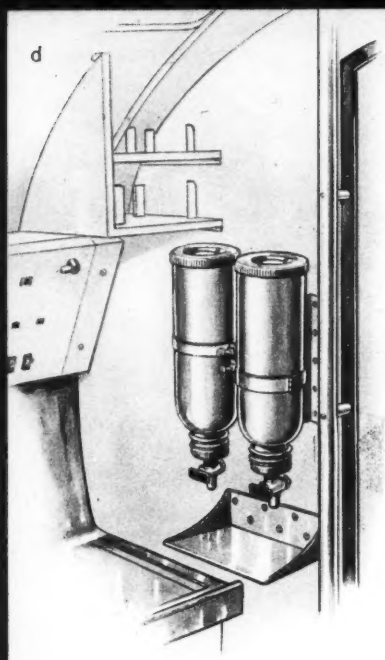
The forward stateroom has not quite the length of the rear apartment, although this is scarcely noticeable since on the rear face of the dividing bulkhead are incorporated built-in wardrobes. At the rear end of the after stateroom, between the seats, are two doors set one to the other as the arms of a rearward-pointing V. The starboard door gives access to a toilet compartment and the port door opens into the main entry vestibule. At the rear of this is a small compartment for accommodating two security officers and a footman-steward, the seating being arranged side-by-side against the rear bulkhead.

In the hold compartments beneath the fuselage floor are stowages for various items of ground equipment and, in addition, capacity for a certain amount of personal luggage. Such is a general overall survey of the internal accommodation planning.

As may be seen from Mr. Beak's excellent paintings of the interior, the colour scheme as approved by H.M. the Queen is remarkably attractive, whilst at the same time it has that quality of restraint which is so very important in the internal decorative treatment of aircraft.

The soft pile carpet is a deep-water blue which, in tone value, is just sufficient of a contrast to provide a firm base for the subdued slate-blue moquette in which the chairs are covered. This same material is used as a dado covering the wall surface up to the sill level of

THE AFTER STATEROOM



THERMOS BOTTLES AND CROCKERY STOWAGE

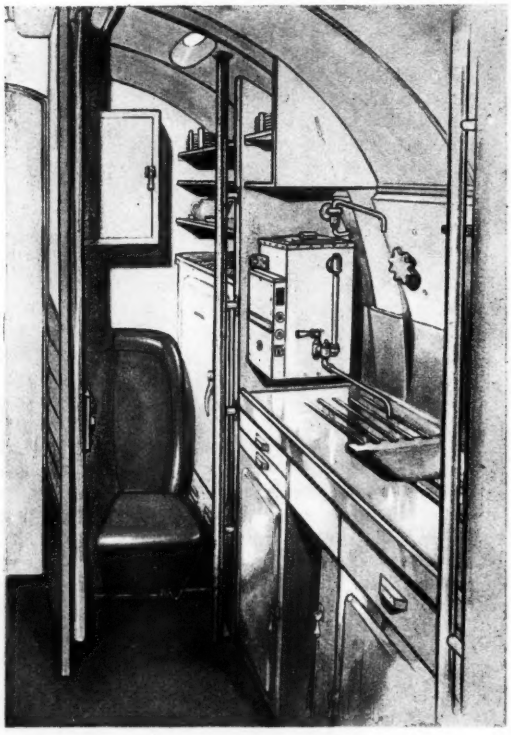
the windows. Emphasizing the window base line is a run of maroon leather piping dividing the dado from the smoky-blue window surround carried out in horizontally pleated leather. An extraordinary sense of spaciousness is imparted by the insistent horizontal motif of this pleating.

Above the windows runs a shallow duct covered in the same smoky-blue leather and bounded top and bottom by pipings of maroon leather. The roof surface above the duct, and the upper part of the bulkheads, is uniformly finished in a fine-grain leather which is coloured a warm old ivory.

Unusual Wood Trim

This pleasing choice of colours and skilful use of tone values is both enhanced and set-off by the deep richness of the wood bookcases and door architraves. An unusual feature of this element is that all the woodwork is Jabroc, the very hard and dense impregnated material widely used in airscrew manufacture. This improved wood has a naturally rich dark colour, this quality together with its extreme hardness being responsible for its choice in this instance, for it may be subjected to ill-treatment without apparent effect and, if scratched or dented, does not show an internal colour different from that of the surface. None of the woodwork has been French-polished; the natural oiled finish of the material has a most attractive soft lustre of its own, and this very wisely has been allowed to stand.

The bookcases are arranged against the walls between each opposing pair of chairs, the fronts being closed by sliding roller doors, and the top surfaces covered with leather of night-sky blue to match the chair-arm coverings in similar material. Sunken, no-fume ashtrays are fitted into each end of the top surface, and in the centre is fixed an ivory-finished "house-phone" by means of which one passenger may speak to another without either having to leave their seat; the telephone switchboard is on the port wall of the commodore's office. Between each pair of chairs can be fitted occasional tables, socketed into the bookcases and supported inboard by a hinged leg which sockets into the floor. The tables are of generous area, with tops of leather to match the chair arms; when not in use they are stowed away in the wardrobes.

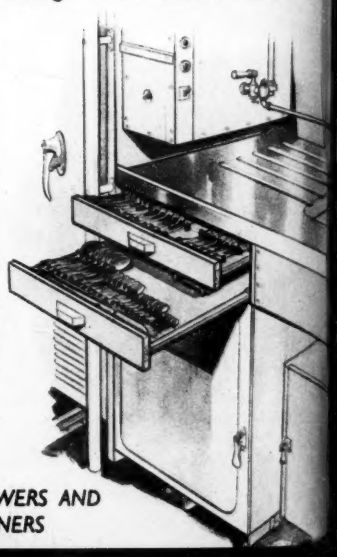


THE STEWARD'S GALLEY

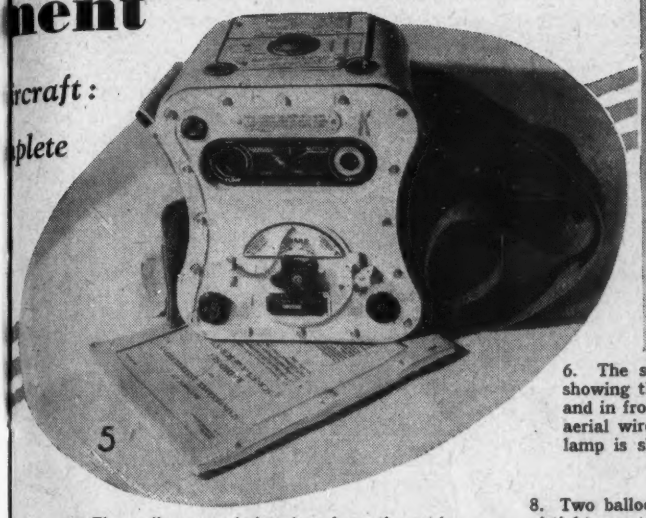
All the chairs are very comfortably upholstered in Dunlopillo and are adjustable for angle of recline. They are fitted with winged headrests and double headpads, and each back-rest and seat is formed by a Chairchute, a new development in Irvin parachutes, the harness for which tucks away at the sides so as to be completely out of sight.

A further unique feature of the Royal Vikings is that variable-density Polaroid windows are fitted. Polaroid is essentially a transparent crystalline membrane with all the crystals aligned one way. In this instance they are vertical, and the effect is that only those light waves which vibrate vertically can penetrate through; thus all glare from horizontal surfaces, such as water and the wings, is stopped.

This quality itself would, of course, be very valuable as an anti-glare measure alone, but by the addition of a second sheet of Polaroid, mounted in a frame which can be fitted to the windows when required, the amount of light admitted can be varied from normal down to nil. The sheet of Polaroid in the removable frame is freely rotatable; when the crystal axes of both Polaroid sheets are parallel the light transmission is normal, but as the inner sheet is rotated the axes are crossed, with the result that the light admitted is progressively cut down until, with the crystals at ninety degrees, no light at all can get through. The windows have been prepared by the Triplex Safety Glass Co., in conjunction with Polarizers United Kingdom, and there would appear to be a very good case for the equipment with such windows of all high-flying civil aircraft, or those intended for semi-tropic and tropic routes. In the Royal Vikings anti-glare screens fitted on swing-away arms are also provided for pilots and co-pilots; this too would appear to be a fashion which might well be copied.



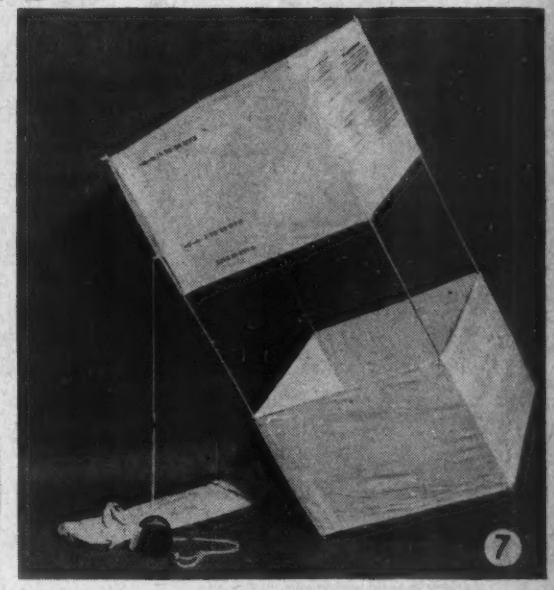
CUTLERY DRAWERS AND FOOD CONTAINERS



5. The radio set as it is taken from the pack. The shape of the set allows the operator to sit with it secured by a canvas strap between his thighs.

6. The set ready for use, showing the handle on top, and in front the reel for the aerial wire. The signalling lamp is shown plugged in.

8. Two balloons in airtight containers and hydrogen generators are supplied for use if there is insufficient wind for flying a kite.



7. The kite and reel for the 100ft aerial.

9. The balloon flying from an occupied dinghy.

A FORCED landing on a flat meadow alongside a main trunk road, with a nearby telephone box, would be one thing, but a forced landing in the desert or on the sea would be another. Happily, engine reliability has made forced landings seldom necessary. Nevertheless, aircraft must be fitted with equipment which may be used by survivors in such a contingency. During the war the Royal Air Force Air/Sea Rescue organization saved many lives, locating survivors, dropping rations and airborne lifeboats, or guiding surface craft to the stranded aircrews. Ultimate survival, however, depended upon the ability to live for those several days which sometimes elapsed before a rescue was effected. This was possible only if some flotation gear was available to keep the survivors out of the water. Many lessons were learnt during the war and the equipment carried on Service aircraft was adequate to ensure survival for several days, while being at the same time sufficiently compact and light in weight to be stowed in aircraft. Equipment of this type is now carried on civil airlines, and the Corporations have developed some of it to suit their own requirements.

Some form of surface craft is necessary, and experience has shown that rubber dinghies are easy to stow, efficient and reasonably seaworthy. B.O.A.C. have developed a

6ft. headroom in a 5/8 seat air liner

An all-metal monoplane with tricycle undercarriage. Accommodation for pilot, co-pilot or wireless operator, and 4 to 7 passengers ; or pilot and up to 8 passengers. Powered by two de Havilland Gipsy Queen 51 engines driving constant speed propellers, and giving an economical cruising speed of 160 m.p.h. Equally suitable as air liner, for charter or hire, luxury private travel, as a freighter or an ambulance. Unobstructed view of the ground from all seats. Cabin bulkheads, panelling and fittings easily removed and replaced. Special attention to accessibility and ease of maintenance, using interchangeable units.

The design of the Percival Merganser provides the outstanding advantage of 6 ft. headroom in the centre aisle of the cabin. This, in conjunction with the very low loading line and level floor, permits passengers to reach and leave their seats in comfort.

The Merganser is designed for maximum passenger comfort and is exceptionally roomy, providing 54 cu. ft. of space per passenger when used as an 8-seater and 87 cu. ft. as a 5-seater.

When the Merganser is used as a freighter, the large main door, with a maximum opening of 5 ft. deep by 4 ft. wide, together with a loading door measuring 4 ft. deep by 3 ft. wide, permit continuous loading and unloading.

Payload: 1350 lbs. for 800 miles, 1825 lbs. for 300 miles.

PERCIVAL MERGANSER

PERCIVAL AIRCRAFT LIMITED, LUTON AIRPORT, ENGLAND · AND TORONTO, CANADA

128-37

EMERGENCY EQUIPMENT

15-seater dinghy to be used solely for passenger aircraft. This is lighter in weight than previous designs, and gives a greater degree of protection against exposure. The dinghies are circular, with a double buoyancy chamber formed by two independent tubes, one above the other. These tubes are separately inflated and each provides a seaworthy dinghy in the event of one being punctured. Rings on the floor can be inflated to form seats which insulate the occupants from cold and wet. Fabric is cemented to the top tube, and this, with a detachable sheet, provides complete coverage and protection.

Dinghies are normally carried in the wing or in the fuselage escape hatches, as in the York, and a sufficient number are always carried to provide for the entire complement of passengers and crew. Attached to the dinghy is a carbon dioxide bottle for inflation so that in the event of an emergency landing the bottle can be broken by remote control from the cockpit, causing the stowage to open and the dinghy to inflate and fall out. The dinghy is attached to the aircraft by a lanyard for hauling it towards the aircraft and to enable the passengers to step from the wings into the dinghy without getting wet.

The equipment in the dinghy includes a jack-knife, paddles, bellows and a repair kit, and stoppers for use in the event of any damage to the dinghy. A sail is not now provided, as it is considered far more important that the dinghy should stay in one position so that shadowing aircraft may maintain contact more easily. Attached to it by a strong lanyard the dinghy has a box of rations containing sufficient food for four or five days. The rations include tins of fresh water and ten sets of sea water desalting units, each one containing a chemical sufficient for taking the salt out of 4½ pints of water. The hard rations consist mainly of food tablets, sweets and energy pills.

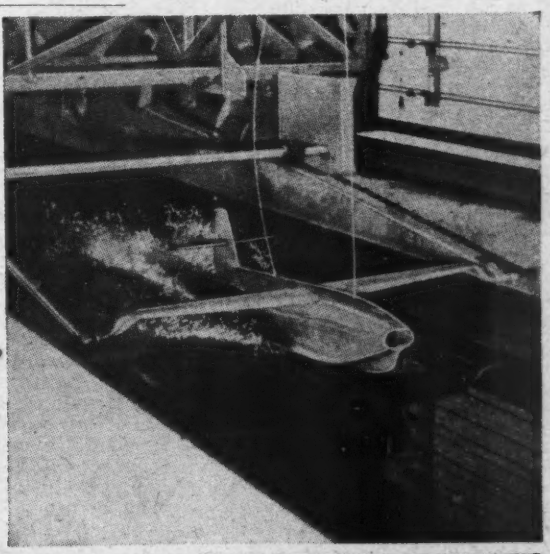
A wireless set is carried as a separate package in the fuselage, in the care of the radio operator, except on the British flying boats of the Plymouth class, where it is stowed with the dinghy and ration pack. The set is so designed that the operator turns a handle, which causes an automatic SOS transmission upon which ground stations can obtain a fix. The wireless set may also be used for transmitting W/T morse signals or messages on a detachable light.

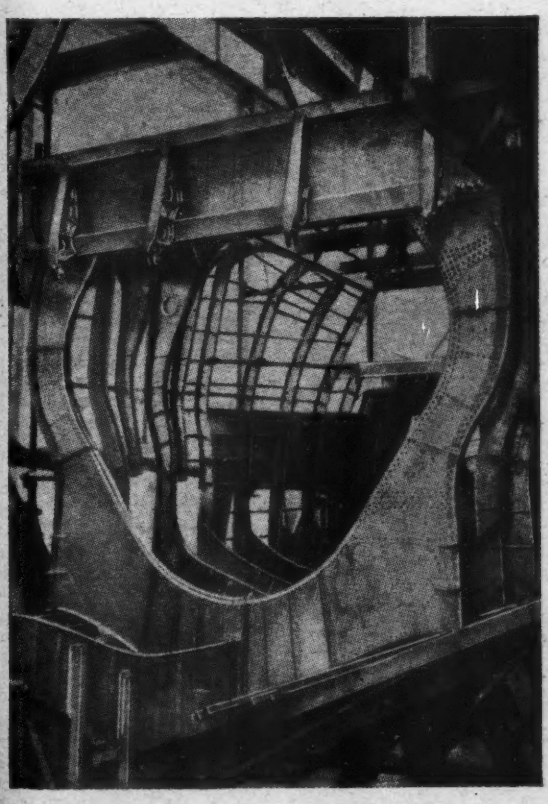
OUR NEW JET-FIGHTER BOAT

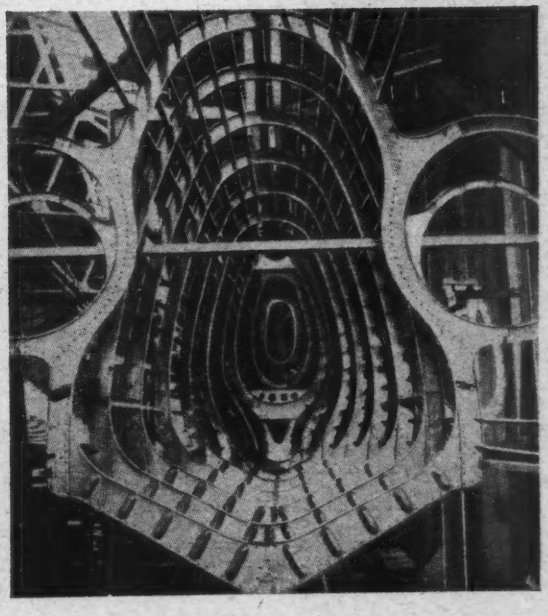
A DESCRIPTION of the Saunders-Roe SR/A1 was published in our issue of November 7th, 1946. This fighter is the first flying boat to be propelled by jets (two Metrovick axial-flow units), and its first flights are awaited with interest.

On the right is shown a model being tested in the tank, and it will be seen that the air intake in the bows is well clear of the surface. Below is a picture of a main frame, the bulges of which accommodate the jet units. In the bottom right-hand corner is shown the rear hull assembly, with jet-orifice supports forming part of two frames.

The somewhat unusual cross-sections are, of course, due to the fact that the jet units are housed inside the hull, while the tail pipes project through the skin aft of the wing.







Airport Planning

Some Thoughts on Present-day Difficulties and Problems : Suggestions for To-morrow : "Square" Plan Recommended

By
Capt. David Brice, A.R.Ae.S.

TEN years ago the construction of an airport presented few problems. A moderately flat field about a thousand yards square was selected, a few drainpipes laid, the worst bumps rolled out and there was an airfield ready, which was as suitable for a Hannibal as for a Moth.

To-day, it is not quite so easy. In Britain, countless hours of Parliamentary and Civil Service time have been taken up in discussions on London Airport, and the talks still go on. In America, in spite of an outward appearance of superabundant normality, the airport situation is just as critical. With La Guardia sinking into the sands of Flushing Bay, Idlewild a lonely wilderness, and the Washington controllers, because of the enormous traffic movements, uttering their daily prayer for fine weather, the architects, designers and statisticians are sprouting hairs which are greyer every day.

And the cause of all the trouble? The need for a scheme to enable aircraft to be cleared through the various traffic departments at a speed commensurate with their aerial velocity without in any way impeding the complicated process of bringing the aircraft down. The latter, if fable is correct, causes even the birds some considerable concern when the visibility is poor.

London Airport and Idlewild are bad, both layouts being reminiscent of a dartboard.

Running through a list of the problems to be contended with in the design of a modern airport, we find that the first requirement is for several large, smooth runways. The present optimum length seems to be 3,000 yards, but there are few who would presume to finalise a figure. Jet transports with slower acceleration will require long runways, especially as a high-speed wing section tends to have reduced initial lift characteristics in favour of minimum drag requirements. Rocket-assisted take-offs are certainly around the corner for everyday commercial use, but airport architects are loath to count on these in their calculations.

Having, then, adopted in principle the idea of long runways, conveniently aligned with the prevailing winds, the point then arises as to whether there should be one, two or three runways all lying in the same direction.

Modern control methods appear to require one runway for landing and another for take-off, and the larger airports such as Heathrow are allowing for two runways for landing and one for take-off. Whether this idea will work out in practice remains to be seen. No one, as far as I know, has tried this scheme out under instrument-landing conditions, but the problems of control would seem to be great. Is there to be one controller for each runway, and, if so, how is the whole pattern to be co-ordinated, and who is to control the taxi-strips? Or will there be one master mind—"Commandant" is the latest word, I believe—who will, with an all-seeing eye, land his seventy-two aircraft every hour aided only by green radar screens and a V.H.F. beam?

Rocket-assisted take-offs are certainly round the corner for everyday commercial use.

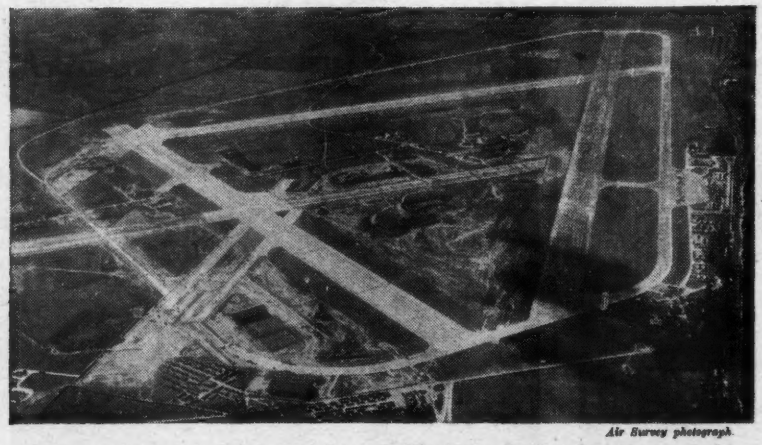
No scheme, however, that one may reasonably envisage, can allow for stalled motors on the runway, flat tyres, or any of the other incidental snags which are bound to occur in normal airline operation. With one untoward incident in a carefully co-ordinated system the whole thing collapses.

And what is the circuit pattern to be when there are three runways? The take-off aircraft can climb up on a straight course until it is a safe distance away, but what about the two landing aircraft? Are they to do opposing circuits, with a consequent collision risk in the event of a badly executed approach? Or will one of them make a tight circuit and the other a wide one? These points sound trivial on paper, but provide very real problems.

As far as blind approaches and landings are concerned, we all know that an experienced pilot can land an aircraft "under the hood" at least for a stunt demonstration. Is it feasible to land seventy-two aircraft an hour by these same methods? Ask any airline pilot and he will say "no."

Consider the railways. A train has merely to follow rails, and is therefore concerned with only one control factor—speed. Its directional movements are controlled by another agency. A simple problem, then, to co-ordinate the trains, which can easily be made to cross over electrical contacts, so that each runs to schedule irrespective of forward visibility. Or one would think so, until one remembers the almost complete dislocation of rail transport in foggy conditions.

So what about an aircraft, the critical matter for which, in the descent procedure, is the actual contact with the ground and the holding of a straight course when on the ground? Any backroom boy who can solve



Air Survey photograph.

A recent photograph of London Airport at Heathrow showing the progress made with the construction of the runways. The Bath road, which runs almost due east-west is on the right-hand side of the picture.

this problem—and I mean *solve it*—will be a miracle man. F.I.D.O. is one solution to blind landing problems, but it is very expensive.

At the moment, the controller's chief headache lies in control of aircraft in the air. Once on the ground a machine is left more or less to its devices and, apart from permission to taxy or otherwise, the pilot is solely responsible for seeing that he doesn't collide with anything.

With seventy-two aircraft movements in an hour, and a complicated taxi-strip layout, something has to be done to

In Britain talks still go on . . . In America La Guardia sinking into the sands of Flushing Bay; Idlewild a lonely wilderness.

control the aircraft at the many intersections. Present thoughts tend towards a traffic-light system, but any motorist knows that it is difficult enough to see traffic lights even at his level on a foggy night—so what about the poor pilot perched high in the nose of his Tudor II with no forward ground visibility in the taxying attitude? It seems, therefore, that some indicator in the cockpit will need to be provided, but, even so, the stopping and starting of aircraft is not as easy as it is with cars. Additional complications arise with the limit of turn radius with most tricycle undercarriages, because the nose wheel is only free to move through a certain angle; turning radii are, consequently, large.

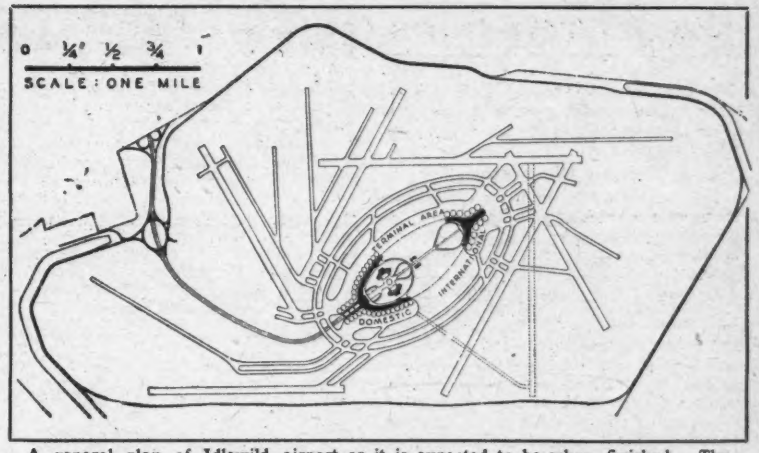
Perhaps, then, the only solution is to reduce the number of taxi-strips to a minimum and, by careful design, to eliminate as many curves and intersections as possible. In this respect London Airport and Idlewild are bad, both layouts being reminiscent of a dartboard. So much for the controller's nightmare. Now what about the traffic side?

In the past, aircraft have just taxied up to a white mark on an apron, someone has opened the doors and the work of loading and unloading has begun. In many cases, this has taken a long time, especially where large pieces of freight are concerned, or where long-distance

A train has merely to follow rails . . . remember the almost complete dislocation of rail transport in foggy conditions.

aircraft have to be cleaned and revictualled.

At London Airport the allowable time for the entire operation is to be thirty minutes, including any maintenance which may be required and refuelling. If I say this figure is absurd, it isn't a rude rebuff to the planners, but a practical criticism of a theoretical assumption. The fault lies in the method of computation of the time required. Instead of working out a reasonable time factor for the traffic operation, and then telling the aircraft controllers how many aircraft they can accept per hour, the traffic facilities planners have been forced into their "thirty-minute" position because the controllers have declared their intention of organizing seventy-two aircraft movements an hour. In practice



A general plan of Idlewild airport as it is expected to be when finished. The major axis of the central ellipse is east-west.

the thing will work itself out, because neither the traffic people nor the controllers will be able to handle that number of aircraft.

In my opinion no set time figure can be set for the servicing of an aircraft. Long-range aircraft require more attention than short-haul traffic; big aircraft provide more problems than small ones; freighters may need several hours for unloading and loading; and internal services may do the whole thing in fifteen minutes. So standardization is not practical. Different aircraft, too, require different facilities, so here again it is a mistake to have identical unloading bays for all types.

One thing appears to be certain—and this is that the airport authorities will need to allot "time" to the operating companies, and it will then be up to the latter to arrange their schedules accordingly. Variations from the allotted time are bound to occur, due to weather and maintenance snags, and so there will still be congestion at peak periods.

Handling Problems

At the moment the planners are working on the idea of island sites for traffic buildings, around which the aircraft will cluster, arriving via tortuous taxi-ways. An alternative scheme would be to nose them around the main building in what is known as the "coastline" pattern, but fewer aircraft can be handled in this manner and towing problems are accentuated. It seems fairly certain that, in the last lap of their journey from the runway to the unloading ramp, large aircraft, and especially the jets, will need to rely on tractors or cables to jockey them into their correct position.

Immediately there is posed another problem. Will a 25 h.p. tractor be able to hold a 300,000 lb aircraft on its own brakes should a sudden stop be necessary? Visions of a snapping tow bar, with a consequent over-running of the tractor, spring easily to mind. Some method will need to be adopted whereby the aircraft's brakes are used either by a man in the cockpit (who would be useless in a tail-wheel type aircraft because he wouldn't be able to see anything) or by a mechanical link to the tractor.

There seems to be no reason why some type of electrical hauler, on a flush rail, could not be employed. This could be connected, via a tow bar, to the nose-wheel, or, alternatively, it could be in the form of a small platform on to which the nose-wheel was taxied. An electrical connection to the cockpit would enable the pilot to control his own progress.

Having put the aircraft safely alongside the "island" terminal building, it would then remain to get the passengers off and away to their destinations and to put the outgoing load safely aboard.

The critical matter . . . is the actual contact with the ground and holding a straight course when on the ground.

This will involve a walk across a loading ramp or taxi-way, or through a tunnel. Since, with the anticipated aircraft movements, the taxi-ways are going to be fairly busy, a tunnel, or rather several tunnels, would appear to be an essential.

Freight, baggage and mail will probably travel on conveyor belts and should present few problems except for the actual work of lifting it into the aircraft's stowage compartments. It seems that nose compartments are finished, and the tendency seems to be towards belly stowage. This will necessitate the use of a crane or winch, perhaps carried as part of the aircraft's equipment.

Tunnels, however, are a complication, and will presumably need to be large enough to accommodate inward and outward passengers at the same time and in fairly large quantities. It should be borne in mind, of course, that these tunnels are mere subsidiaries to the giant tunnel which will pour the many thousands of passengers a day in and out of the main island-site terminal building. From all accounts this at London Airport is to be a kind of aerial "Radio City," with cinemas, restaurants, and a three-ring circus. Through this will surge a solid mass of tired and excited people either coming from or going to the far corners of the world.

The "island" site arrangement will also provide obstacles in the way of the successful co-ordination of rail and air interests. One can hardly imagine a double-tracked railway tunnel as well as the one for motor vehicles. Mail and freight, then, will need to arrive by

AIRPORT PLANNING

road, which, added to the large passenger coaches, should provide traffic for a tunnel on the scale of the one which goes under the Mersey.

Ground Congestion

In addition to the numerous buildings required for traffic purposes, there are, of course, the added requirements for hangars. At the moment, temporary buildings are being erected at London Airport, but the eventual plan calls for a considerable acreage for hangars to the east of the runways. More congestion will then be caused along the taxi-strips unless it is the intention to construct special strips for this purpose. Motor roads will also need to be provided for maintenance staffs. It seems unlikely that anyone will bother to build a hangar to accommodate the 300,000 lb aircraft, but "nose" coverage may need to be provided. On the basis of seventy-two aircraft movements per hour, there is going to be one long procession of aircraft to the hangars, which will probably have their own traffic control systems.

On the purely technical side much work is being done and still has to be done in the matter of future airport lighting. London Airport is fairly up to date in its lighting, but one often hears the criticism that amidst the blaze of lights from the million street lamps of London, one searches for the darkest patch to locate the airport. Experiments are now under way to determine the width of flare paths. War experience has shown that very wide flare paths tend to confuse the pilot since the perspective is too wide and height misjudgment is likely to occur.

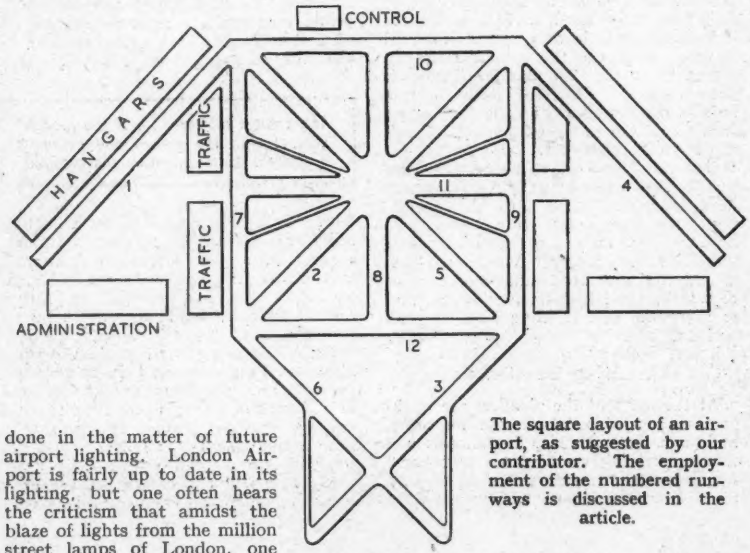
Will a 25 h.p. tractor be able to hold a 300,000 lb aircraft on its own brakes ?

And then there is the question of good "approaches" for bad-weather flying. London Airport is unlucky because, within three miles of and in line with the N.E./S.W. runway, is the 330ft Heston gasometer. Chicago lost a similar one when a B.24 flew into it. And, lastly, one can say that the remaining problem is to construct an airport in such a way that expansion is possible if future airport design requires it.

All these problems—so many of which do not exist when small quantities of aircraft are being handled, but which are magnified out of all proportion when the movements reach the thousand class—are facing the planners of the future. No one can envy them their task, but all criticize—and most unconstructively. Here, however, is my suggestion for the ideal airport layout, taking into account all the considerations which I have mentioned so far.

On the basis of 72 aircraft movements per hour the procession of aircraft to the hangars will require its own traffic control system.

Start in a simple way with a square airfield. That is, one with two N.S. runways and two E.W. runways. (And, by the way, those who contend that a N.S. runway is not necessary near London should have been in a Lancastrian with me on a recent very dark and wet night when a 35-knot wind was blowing from the south.) Join up the diagonals and we have one N.W./S.E. and one N.E./S.W. runway. Project parallel runways from the top of the box and we have two more in the same direction.



The square layout of an airport, as suggested by our contributor. The employment of the numbered runways is discussed in the article.

Here, then, is the basic design. Extensions to produce three runways in each direction can be added as shown in the diagram. And since London Airport is working on the three-runway principle, we'll consider this design.

The advantages are as follows. With the exception of the four short, straight taxi strips across the middle, and two others, all taxying can be done on runways and therefore at a very much faster rate than would otherwise be possible. The ends of the runways would be extended beyond the normal required figure, so that taxying across the ends would be both safe and feasible.

All passenger and freight facilities would be arranged along the outer sides of the N.S. runways With a 3,000-yard runway this would provide 18,000ft of available frontage for aircraft either to "nose" into the loading ramps or to be accommodated in any other manner. A gap would be left in the building sites to allow suitable approaches for the middle E.W. runway, but would not seriously reduce the available work area. Straight roads and railway tracks would feed into the back of this terminal area.

Terminal buildings on both runways can be used at the same time. Thus, with a N.E. wind aircraft would land on runway 1, then taxy straight down runway 7 to the traffic building. If two runways are required for landing, runway 3 would also be used, the aircraft taxying down runway 12 to runway 7. Runway 2 would be used for landing and on a 300ft-wide runway aircraft can pass each other. It will be appreciated that an aircraft with a 200ft wing span does not require that width of runway; its wings can project beyond the limits of the runway. When very large aircraft are involved, and where their wing span is likely to interfere with aircraft taxying in the opposite direction, a slightly more complicated taxi programme can easily be worked out with the aid of the centre runways and taxi-strips.

Some Advantages

Alternatively, aircraft landing on runways 1 and 3 could taxi, in the first case, along runway 10 to runway 9, and, in the second case, straight down runway 9. Take-off aircraft would taxi down 9 and then along 12 to the take-off runway, which would be number 2.

On the N.S. runways, landings would be restricted to one runway, either 7 or 9, and the terminal buildings not used on that side. This forms a disadvantage, but as there are no facilities at all for this landing direction at London Airport, these runways could be ignored altogether and the centre N.S. runway deleted.

As can be seen from the plan, no tunnels would be required, and all buildings are close together and therefore easily accessible. Hangar space is situated close by, and extra taxy-strips could be constructed if required to link them with other runways.

Compare this design with the accepted version of London Airport and it will be apparent that it would be much simpler to control and operate and, therefore, would permit a considerable speeding-up of all processes. Taxying would be fast and towing reduced to a minimum; there would be no complicated taxi-strip control, no tunnels, easy access by road and rail, no congestion in terminal facilities, good opportunities for expansion of both runways and buildings and reduced constructional expenses because of minimum taxi-strip lengths.

One other point alone requires comment and suggestion, and this is that, whatever design is used (and doubtless the London Airport design is now finalized), planning will require more than one airport for London. Not a mere improvised secondary airport, but preferably of the same design as that finally agreed upon for the first. This, alone, would solve some of the problems which are facing the planners to-day.

Anticipation of Overspeeding

New de Havilland Pre-setting Airscrew Governor

AN important design development to minimize the risk of momentary overspeeding in engines which would be adversely affected by it is announced by de Havilland Propellers, Ltd. Known as the pre-setting airscrew governor, this device anticipates the danger of overspeeding and assists the constant-speed unit to prevent it.

All airscrew governors operating on the centrifugal-governor-controlled metering valve principle depend upon the departure from the governor setting in the form of an increase or decrease of r.p.m. to bring them into effect. In operation this often results in a quite appreciable r.p.m. underspeed or overspeed. Under normal conditions this characteristic is not of great importance, but when a sudden large opening of the throttle is required, such as would be used for an emergency overshoot after an approach to land, the momentary excessive r.p.m. may become very important.

Use in Overshoot

Considering an overshoot from the point of view of the airscrew and constant-speed mechanism, the circumstances are that on the approach an engine is throttled back, the airscrew blades are in the full fine-pitch position, and the high-pressure side of the pitch-change mechanism is open to drain (Fig. 1). On fully opening the throttle to give maximum power the high-pressure side of the mechanism remains without pressure (Fig. 2) until the r.p.m. rise above the maximum figure selected. The governor then, for the first time, delivers oil to operate the mechanism and coarsen the blade pitch (Fig. 3). Since the pitch-increase side of the mechanism can only be primed after the r.p.m. have passed the selected value, overspeeding occurs during the brief time lag between beginning of charging the system and the completion of the pitch-increase movement.

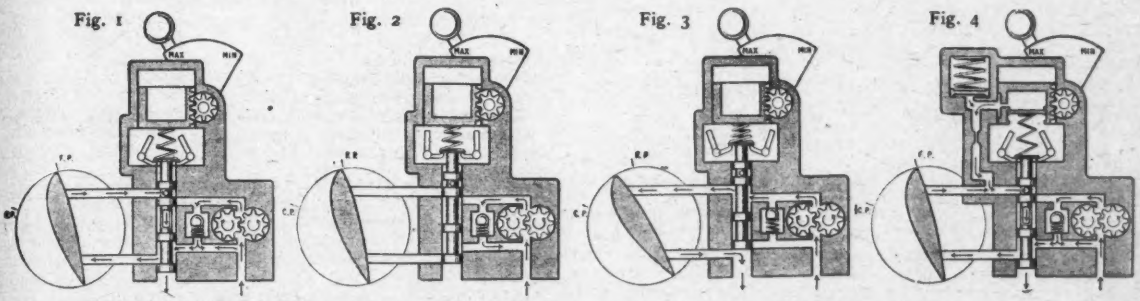
The effect of the new pre-setting governor is to prepare the constant-speed unit to react to the sudden rise in r.p.m. This is achieved by the addition of a mechanism which responds to the lack of oil pressure in the constant-speed unit following prolonged underspeeding, but which is normally held inactive by an auxiliary oil accumulator.

This new governor switch (Fig. 4) is not very different from other de Havilland designs, but has the following alterations and additions: A piston against which bears a governor spring is introduced into the constant-speed rack, and the cavity in the rack behind the piston is connected by way of an accumulator and bleed to the high-pressure delivery line between the governor metering valve and airscrew. The oil connections are all contained within the governor unit, and the new accumulator is integral with it.

The operation of the pre-setting governor in the case, for example, of an overshoot, is as follows: (Fig. 4 illustrates in diagrammatic form the condition with the pitch lever and airscrew blades in full-fine (and the throttle closed for a landing approach). Since there is no pressure in the governor delivery line to the airscrew, the pre-setting piston in the rack will be displaced by the governor spring, thus reducing the load on the spring and the governor r.p.m. value represented by the control setting. The piston of the accumulator will also be forced forward by its spring. When the throttle is opened suddenly and the r.p.m. rise rapidly, the governor assumes the overspeed condition, and, therefore, supplies oil to the airscrew at an r.p.m. value below that selected, due to the reduction of load on the governor spring. As the speed continues to rise, the pressure builds up in the airscrew delivery line and is transmitted to the pre-setting piston in the governor rack by way of the bleed and the accumulator. The piston is thus returned to its normal position in the rack and the original governor-spring load value is restored.

The time taken for the piston in the rack to re-set the governor-spring is determined by the dimensions of the bleed and the accumulator stroke. This time lag is sufficient to allow the oil system to become fully primed and to bring the airscrew blades into a pitch sufficient to hold the engine at the selected speed by the time the r.p.m. actually reach that value. The pre-setting function is illustrated in graph form in Fig. 5.

For all normal small fluctuations of r.p.m. the speed control mechanism behaves as if the governor spring were seated directly on the rack, the accumulator maintaining the pre-setting position at the bottom of its travel in the rack.



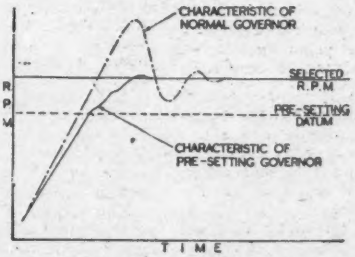


Fig. 5. The pre-setting function shown in graph form.

FLYING SHOWROOM

A MINIATURE "Britain Can Make It" exhibition is to leave for an aerial tour of Northern Europe early next month.

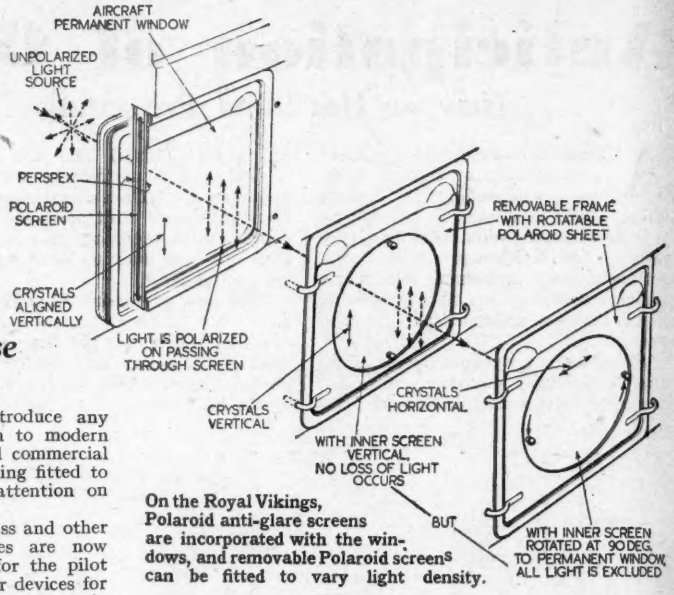
It will travel in a specially equipped Bristol Freighter which will virtually be the world's first flying showroom and will contain a series of "stands" 2ft 4in square, displaying light engineering and electrical goods.

Top weight allotted to each exhibitor will be 1 cwt, but accommodation will be provided for a restricted number of exhibitors' representatives, engineers and —most important of all—an air hostess in charge of a cocktail bar!

A "stand" in this enterprising show will cost £300 for the entire trip and this will include the services of a qualified engineer to answer technical queries *en route*.

Polarized Screens

What They Are and How They Work : An 1818 Discovery in 20th Century Use


AIRCRAFT PERMANENT WINDOW
UNPOLARIZED LIGHT SOURCE
PERSPEX
POLAROID SCREEN
CRYSTALS ALIGNED VERTICALLY
LIGHT IS POLARIZED ON PASSING THROUGH SCREEN
REMOVABLE FRAME WITH ROTATABLE POLAROID SHEET
CRYSTALS VERTICAL
CRYSTALS HORIZONTAL
WITH INNER SCREEN VERTICAL, NO LOSS OF LIGHT OCCURS
BUT
WITH INNER SCREEN ROTATED AT 90 DEG. TO PERMANENT WINDOW, ALL LIGHT IS EXCLUDED

On the Royal Vikings, Polaroid anti-glare screens are incorporated with the windows, and removable Polaroid screens can be fitted to vary light density.

ALTHOUGH polarized light does not introduce any really new idea, its practical application to modern needs is only just beginning on a normal commercial basis, and the fact that Polaroid windows are being fitted to the Vikings of the King's Flight has focused attention on this development.

Most people are already aware that Polaroid glass and other transparent materials with polarizing properties are now coming into use to eliminate glare and dazzle for the pilot and motorist, and that there are all kinds of other devices for the regimentation of light, such as lens filters, stereoscopic films and various optical instruments which all work on the same basic principle.

As in so many great discoveries, the "secret" of Polaroid is fundamentally a very simple one. A beam of light is composed of vibrations radiating out in all directions at right angles to the beam's path, and it was discovered as long ago as 1818 by a French physicist, Etienne Louis Malus, that by looking through a piece of calcite, or certain other natural crystals, the glare of the sun as reflected in windows, could be eliminated. This was because the crystal's molecular structure had a parallel alignment and would only pass those light vibrations, or waves, which were themselves parallel with this alignment, though Malus may not have known this at the time. Then, in 1852, Dr. William Bird Herapath found that tiny crystals formed by combining iodine with quinine salt possessed the same remarkable light-polarizing properties. He also discovered that, although these synthetic crystals were transparent, they became opaque if placed crosswise one above another. In other words, by placing two crystals with their respective molecular alignments at right angles to each other, the passage of all light was stopped—one stopped all but the horizontal rays and the other stopped those.

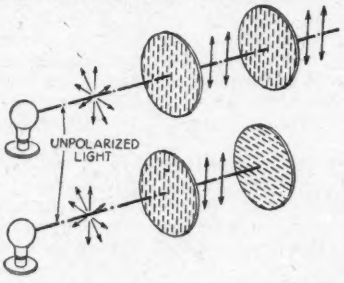


Diagram of light polarization showing how, when polar axes are crossed, transmission is stopped.

And that is the fundamental principle on which Polaroid glass and film works.

But although Dr. Herapath discovered how to make an inexpensive artificial polarizer, he was completely stumped when he tried to make one big enough to be of any practical use. In fact it was not until 1934 that the problem was finally solved, although a number of people had attacked it from time to time during the intervening years.

Modern Manufacture

Edwin H. Land, a young science student in Boston, read all about Malus and Herapath and, when a boy of fifteen working in his crude laboratory at home, he began trying to perfect some material suitable for general use which would polarize light. It was ten years later that he found the answer, and it was so simple that, like many another inventor, he marvelled most of all that nobody had thought of it before him. Instead of trying to make one large crystal he decided to make them infinitely smaller, align thousands of them in the same direction to form a kind of huge composite crystal, and then fix them between two transparent surfaces.

However, there was still the little problem of how to carry his idea into effect—how to take a vast number of rod-like iodo-quinine crystals of microscopic size and point them all in the same direction. Various possibilities were no doubt considered, but he got the right idea when he discovered that if he placed a pencil on a thin rubber sheet and stretched the sheet, the pencil slowly turned in the direction of the stretch. He applied his crystals, in a solution, to a thin sheet of transparent plastic, stretched the sheet, "froze" it so that it could not contract again, and cemented it between protective layers of Cellophane-like material. The plan worked; the crystals were aligned parallel to one another in the direction of the stretch and the result was the very first sheet of "Polaroid"—and, ultimately, the formation of the Polaroid Corporation.

Screen Applications

While the application of polarized light has many fascinating fields, notably the elimination of glare and dazzle for the greater comfort and safety of the motorist, by day and night, we are only concerned for the moment with its use in aircraft. One extremely valuable contribution to aviation is its use in blind-flying instruction, since it enables pupil and instructor to sit side by side, the pupil seeing only his instruments but the instructor having a slightly tinted, but otherwise normal view of the surrounding land and skyscape. The danger inherent in various other training devices which limit the instructor's field of vision is thus eliminated.

It works like this: The aircraft's screen and windows are covered with a Polaroid film which admits only the vertical light waves, and thus the instructor, who wears no goggles, is protected from the reflected glare from horizontal surfaces (from the wings, sheets of water or snow, etc.) and has a better defined vision than through ordinary glass or Perspex.

The pupil, however, wears Polaroid goggles which admit only horizontal light waves and thus he can see his instrument panel inside the aircraft but cannot see through the screen or windows since they eliminate the horizontal rays—the only ones his goggles will pass.

A variant of this application is employed on the Viking aircraft of the King's Flight which are to be used by the Royal Family during their South African tour. The normal Viking dry-air-sandwich windows have been fitted with a Polaroid interlayer in the cavity between the Perspex panes. This acts as a normal anti-glare measure; but as a refinement a second sheet of Polaroid, mounted in a frame, can be fitted to the windows when required. This latter Polaroid sheet is rotatable in its frame, and when its crystals are aligned with those of the "permanent" windows (i.e., when they are also vertical) no additional interruption to the passage of light is caused: however, as the rotatable sheet is turned, the amount of light admitted to the interior is gradually reduced until, when the sheet is turned through 90 deg relative to the permanent screens, all light is excluded.

LONDON AIRPORT

Official Report of Advisory Layout Panel : Reasons for Selecting Staggered Parallel Runway Pattern

THE panel appointed by the Ministry of Civil Aviation to consider and make recommendations as to the best layout for an international civil airport for London has made its report. The terms of reference included the definition of the area available, and the stipulation that the maximum use should be made of the three runways which in September, 1945, were being constructed for R.A.F. purposes at Heathrow.

The boundaries were given as being, on the north side, the line proposed for the diverted Bath Road, which follows approximately the existing Cherry Lane. The boundary on the east was the River Crane, on the south the Great South-West Road and Staines reservoir, and on the west the Longford River and Harmondsworth village. The airport was to be developed in three stages, and the construction of each stage should interfere as little as possible with its use.

It was necessary that, as the airport had to be brought into use at an early date, the three runways already under construction should be completed. These three runways and temporary terminal buildings, therefore, constituted stage I of the development. For stage II the panel were required to plan for maximum air traffic capacity south of the Bath Road, in view of the need to postpone for several years the diversion of that road and the demolition of housing north of it. Stage III allowed for full use to be made of the site. An adequate area was to be provided for loading purposes and terminal buildings commensurate with the capacity of the runway system.

In each stage of the development areas of sufficient size were to be allocated for purposes of aircraft maintenance which were readily accessible to the terminal area and public road. While the layout was to be made suitable for the use of the largest aircraft which could be reasonably foreseen, allowance was to be made for extending and widening the runways wherever possible.

Technical Working Party

The airfield standards and practices which had been formulated by P.I.C.A.O. were studied but, as their recommendations were only tentative, the panel decided to seek guidance on certain technical principles. As there was little knowledge of multiple-runway airports in actual operation, it was decided that more rapid progress would be made by the formation of a working party of the members. As a result, conclusions were reached on runway dimensions, capacities and the distances necessary between parallel runways.

It was assumed that all runways would be used in conjunction with instrument aids. It was considered that all runways, taxi-ways and aprons should be designed for aircraft having an all-up weight of at least 360,000 lb, carried on four main wheels. Certain aircraft movement rates were assumed for purposes of comparison between different runway patterns and as a basis for determining the size of the terminal area.

Several basic patterns were considered and examined from the points of view of safety in operation, traffic capacity, interference by taxying aircraft with runways in use, taxying distances, and flexibility of use of the area of paving required per aircraft movement. The conclusion was reached that either a tangential pattern or a staggered parallel pattern was most likely to give the best results. These two patterns were examined with great care, especially in view of the proposals in America to adopt tangential patterns. The widely separated approaches, simplified taxi-ways and high theoretical traffic capacity of this pattern were all taken into consideration, but there were disadvantages. If, for example, an aircraft overshot it might cross the path of an aircraft taking off. Furthermore, because the runways converge it would be difficult to eliminate the risk of landing aircraft colliding on the ground or in the air in conditions of bad visibility.

The panel would not accept the American claim that a twelve-runway layout was capable of 360 movements per hour by day in clear weather, but considered the rather lower figure of 240 to be more easily attainable. In conditions of poor visibility, however a timing system would be necessary, and to achieve a rate of 60 landings per hour on three runways it would be necessary for each aircraft to control its approach speed to within plus or minus 15 m.p.h. of an agreed datum of approximately 125 m.p.h. As Heathrow must operate in such conditions for about a quarter of the time, it would be impracticable to schedule traffic to take advantage of the higher landing rate possible in fair weather. There were other objections to the tangential pattern including some in applying it to this particular site.

Parallel Runways Pattern

Examination of the parallel pattern showed some advantages. With this principle the primary runway would be on one side of the terminal area and the two secondary runways on the other. For normal operations one secondary runway would be used for landing and the other for take-off, while the primary runway would be used for both landing and take-off. For planning purposes the panel assumed that the maximum practical number of movements per runway in fair weather would be either 40 aircraft landing per hour, or 80 taking off per hour. In a peak hour, therefore, 160 movements should be possible. Under bad weather conditions it was estimated that there would be little difference from the total rate of movement calculated for the tangential pattern of 120 per hour, and that this could be achieved without the inherent dangers of that pattern. Application of the pattern to the site showed that it could be accommodated without too great an encroachment beyond the boundary, and it was concluded that the staggered pattern was preferable to the tangential pattern.

Full advantage of the staggered parallel pattern could only be obtained with the terminal area enclosed by the runways.

Primary considerations for the terminal area were the size of the area to meet the requirements and the practicability of providing access underground. Experience has shown that on an average each aircraft occupies a loading bay for half an hour. With a movement of 160 aircraft per hour, therefore, 40 loading bays would be necessary. To include in the terminal area the necessary buildings for Customs, G.P.O., freight stores, car parks, roadways and helicopter landing and parking area, it was considered that 60 acres would be necessary. For maintenance and other purposes it was estimated that in the final stage 300 acres would be adequate.

The Final Plan

The final plan recommended that three parallel runways in each of the three directions should be provided, with the main runways in the east-west direction. Meteorological data showed that the most frequent winds were to be expected in the sector from south-west to west, and the west was chosen on account of other site considerations.

The stages of development decided upon were: Stage I, completion of the R.A.F. scheme; Stage II, a dual parallel runway system south of the Bath Road, with a large part of the central apron together with portions of the permanent terminal buildings completed. The underground access would also be completed. Stage III would consist of extending the main runway westwards, and the construction of three more runways north of the Bath Road, together with connecting taxi-ways and increased facilities in the terminal area.

The estimated maximum capacity per hour of the airport during each stage, in fair weather, is: Stage I, 40 rising to 50; Stage II, 90 rising to 100; Stage III, 160 or more. In visibility of less than 1,000 yards, or cloud base under 500ft, the estimated capacity in Stage I is a third, Stage II a half, and Stage III two-thirds. Based on this capacity the maximum number of passengers passing through the airport is estimated in the three stages as being 1,000, 2,500, and 4,000 or more.

GOOSE BAY

RECONVERSION work at Goose Bay Airport, in Labrador, is understood to be well under way. Accommodation will be provided for 150-200 passengers for over-night stops, and provision is being made for the families of the airport staff. The programme of rebuilding was started last October and should be finished by the end of this summer. This airport is used by the trans-Atlantic operators, only as an alternative to Gander in the event of that terminal being weatherbound.

CIVIL AVIATION NEWS

Tudor Statement : Accident Reports for P.I.C.A.O. : S. Ireland Airport

ON THE STEP. : The Golden Hind, which is back in service again on the B.O.A.C. route to Cairo after a short stay at Augusta for minor repairs.

THE TUDOR POSITION

IT has been announced that in the interests of safety the Tudor I will not be operated by B.O.A.C. until modifications and further trials have taken place. The single aircraft on which the corporations have been carrying out trial flights, and a proving flight in Africa, has exhibited certain faults which are considerably magnified when the aircraft is flown at the all-up weight of 80,000 lb in hot climates, and when taking off at high altitudes. The defects mentioned are a pronounced tendency to swing at take-off, tail buffeting within certain speed ranges in turbulent air, and an unexpectedly low A.M.P.G. figure. It is also understood that the cabin heaters are still not working satisfactorily.

One of the defects of very large tail-wheel aircraft is their tendency to swing during the take-off run, and a slight tendency had previously been observed with the Tudor. The makers' explanation of this sudden increase, which has taken the aircraft beyond the margin of safety, is that the extra flap required for take-off at high altitude in hot climates has blanketed the slipstream over the sail surfaces. It is believed, however, that B.O.A.C. are not altogether in agreement with this explanation Tail buffeting, resulting from turbulent air leaving stalled portions of the wing root fairings, inboard engine nacelles and wing trailing edges, also occurs with most aircraft, but in the case of the Tudor, at speeds considerably above the stall. The high fuel consumption, which can be attributed to the increased drag associated with the same source of trouble as the tail buffeting, will be tackled by an aerodynamic clean-up. A further increase in A.M.P.G. should also result from an Tudor position also appears in an editorial on page 155.

The modifications necessitated will take at least three months to complete, and should they take longer it is doubtful whether it will be possible to complete trials and proving flights in time for Tudors to operate this year. Commentary on the Tudor position also appears in an editorial on page 155.

P.I.C.A.O. PROGRESS REPORT

THE President of the Interim Council of P.I.C.A.O., Dr. Edward Warner, has issued a report on developments during the Council recess. The recommendations of the Cairo conference have not yet been put into effect, and the President views with considerable alarm delays which have occurred in establishing P.I.C.A.O. procedures in all the regions in which regional meetings have been held, except the North Atlantic. In the meantime, letters have been sent to the States of the Middle East region calling attention to certain recommendations of the Cairo meeting for the installation of facilities and the maintenance of services at particular points in the region.

The Communications Division recommended that the new "Q" code, with amendments from the form developed at the Dublin and Paris meeetings and included in P.I.C.A.O. procedures fo air navigation services, should be brought into effect internationally on March 1st this year. Member States have been asked if they can comply with this request. A system of code symbols for the identification of airports has also been recommended. At the first two regional meetings a system was developed of identifying airports by groups of four letters, of which the first one or two would give national identification and the remainder the specific place. The United States has found this system unsatisfactory and proposed three-letter groups. As an agreement was not reached, Member States are to be asked for their opinion. I.A.T.A. already has an extensive three-letter code of its own, contained in a book of some 225 pages and entitled "The General Aviation Code." Over 2,000 three-letter groups already represent place names as used for reservations and other commercial messages. There is no correlation whatsoever, however, between the I.A.T.A. code and the samples of the three-letter code for identification that were presented through the Communications Division. It was also recommended that the Secretariat should undertake a study of the preparation, production and distribution of consol charts by some central agency in the interest of securing suitable and uniform charts. In view of the experience of the United Kingdom in the preparation of consol charts, comment has been requested. The United Nations Assembly has approved the draft agreement between that assembly and the International Civil Aviation Organization, subject to the condition that I.C.A.O comply with the decision of the United Nations Assembly upon the present government of Spain. The exact effect of the adoption of this resolution and the nature of the steps which the first assembly would have to take in order to comply with it are open to some questions.

The most important indication of co-operation in air navigation facilities was considered to be the Icelandic request for financial assistance in operating the Iceland Loran station. The chief of the Communications Section is inspecting the station in Iceland and will discuss technical requirements for its continued operation, further training of personnel and the basis of the existing estimates of operating cost. At least five States apear to be interested as present users of Loran in the navigation of their aircraft in transatlantic services. Three of those States have already indicated their willingness to contribute to the continued operation of the Icelandic station. It is understood that Afghanistan and Ethiopia have expressed interest in receiving technical or operational assistance.

The general trend of replies from interested States in the Euroean area indicates that an early meeting for reconsideration of the European Traffic Control Division arrangements is unnecessary The Air Navigation Committee has recommended that a meeting in April would have the advantage of being in a position to take account of the winter experience. In the meantime, all States have been asked to take steps to expedite the effective operation of their traffic control plans and to conduct discussions on the co-ordination of plans in adjacent territories

NORTH STAR

TRANS-CANADA AIR LINES' North Stars, the D.C.4s with Merlin engines, are expected to be in operation on the Atlantic service quite soon. Mr. F. M. McGregor, the company's operations manager, is in this country to complete arrangements for the new schedules. Six will be put on the transatlantic service, and as more are delivered they will first of all fly on the route from Montreal to Bermuda, and then on the Canadian domestic services. Mr. McGregor, who is the senior pilot in T.C.A., personally started the company's first route in 1937 between Vancouver and Seattle, and the following year opened the air-mail service between Winnipeg and Vancouver. As announced in *Flight* of January 23rd, the second production model of the North Star was expected in this country for demonstration last month.

GUERNSEY CHARTER COMPANY

A NEW charter company has been formed in the Channel Islands by Messrs C. F. Hutchesson, Anthony Drake and Roy Payne. The company, known as Guernsey Air Charter, Ltd., is operating from the airport at La Villiaze, and the London agents are Atlas Aviation. Several long-distance charters have already been flown, including trips to Johannesburg, with passengers, and to the Canary Islands for fruit. Four Consuls and two Proctor aircraft are in operation, and three Proctors, five Ansons and six Mergansers are on order.

AIR FRANCE AGREEMENT WITH UNITED AIR LINES

AIR FRANCE and the American company, United Air Lines, have come to an agreement by which the French transatlantic service will link up with the 9,000-mile domestic system of United. Under the agreement reservations may be made and passages booked in the sixty cities which are served by United for terminals in the Air France network, which serves fifty-one countries and covers about 100,000 miles. Direct passenger connections and the through carriage of baggage between points on the systems of the two companies is therefore provided. This will place such towns as Chicago within twenty-one hours of Paris and twenty-three hours of Amsterdam.

AUSTRALIAN AVIATION BUDGET

THE Australian Department of Civil Aviation has made an appropriation of 5½ million pounds to meet the cost of airport construction and the development of flying facilities during the current financial year. Work on the new international airport at Sydney is to be started. The Essendon Airport at Melbourne, and a secondary airfield for light aircraft to serve the same town, are also to be developed. At Adelaide a site is to be prepared for an airport and three new runways are to be constructed. The taxiways and aprons at Eagle Farm, Brisbane, are to be extended, and new buildings erected. Work on a new airport is due to start this year at Davenport. Additional runways are to be built at several other airfields in Western Australia. In addition to these new constructions, £518,000 has been approved for radio communications and air navigation facilities. Sixty R.A.A.F. airfields have been taken over by the Department, and 1¾ million pounds has been set aside for the construction of buildings at these airfields and for their development as airports. Included in the 1947 programme is a scheme for the separation of commercial airline operations from the activities of clubs and private owners. The Department hopes to provide separate airports at all the capital cities.

It has been reported by a pilot who recently flew to New Guinea and New Britain that the airstrips there are rapidly being covered by jungle growth, and that unless some action is taken very soon many of these airstrips will be useless

At the end of last year 510 aircraft were registered in Australia, of which 152 were Tiger Moths and 37 were Dakotas. The number of licensed engineers has increased from 623 in 1939 to 1,523 in 1946.

AIRPORT IN WATERFORD

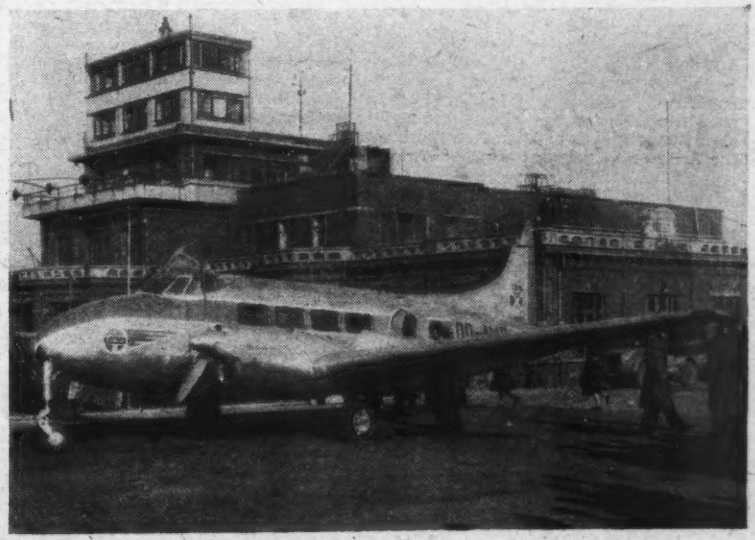
DUNMORE EAST has been granted a licence under Air Navigation Regulations of Eire "as a regular place of landing or departure by aircraft carrying passengers or goods for hire or reward and for instructional flying." This new airport, which has been developed by Mr. Arthur Westcott-Pitt, is the only one in Ireland, south of Collinstown and Shannon, licensed for the use of civil aircraft. There is ample hangar accommodation and parking enclosures for aircraft, and customs clearance facilities will be available quite soon. The customs airports at Bristol and Liverpool are within ninety minutes' flying time, and London, Edinburgh and Cherbourg are less than three hours away. This airport, on the east coast of Ireland, will consequently be of great convenience to private owners flying from this country. Aviation petrol will be available and a ground engineer always in attendance. The airport is not open to the public yet and may be used for flying only with the prior permission of the owner. Mr. Westcott-Pitt, however, does not intend to make any charge for the landing of private aircraft.

B.E.A. TAKES OVER

ON February 1st the network of air services operated by the Associated Airways Joint Committee was handed over to British European Airways in accordance with the provisions of the Civil Aviation Act. Simultaneously the English and Scottish Divisions of the Corporation came into existence. The Associated Airways Joint Committee was formed in 1941 from a group of private companies for the purpose of operating on behalf of the Government those services which it was essential to maintain in the national interest. Included in this group were the four operating companies, Railway Air Services, Scottish Air Services, Great Western and Southern Air Lines, and Isle of Man Air Services. The services run by those operators have now been made the responsibility of the English and Scottish Divisions. Cdr. G. O. Waters, manager of the English Division, will be immediately responsible for services between London and Northern Ireland through Liverpool and Manchester, and to the Isle of Man and the south-west of England. Mr. George Nicholson, manager of the Scottish Division, will be responsible for services between Scotland and Northern Ireland and between Glasgow and the Hebrides, and most services to the North of Scotland, the Shetlands and the Orkneys. Channel Islands Airways will continue to operate services between the Channel Islands and the United Kingdom, and Allied Airways between Aberdeen, the Shetlands and Orkneys.

P.I.C.A.O. AND ACCIDENTS

THE P.I.C.A.O. Accident Investigation Division was due to meet for its second session on February 4th. It is expected that the Division will decide to collect the reports on investigations into aircraft crashes no matter where they occur, and to publish analyses of their causes in an effort to prevent the recurrence of similar accidents. It is also expected that the delegates will discuss the possibility of establishing regulations to govern the investigation of aircraft accidents. National laws and regulations vary considerably throughout the world, and it is hoped to ensure, by securing sufficient uniformity, that every accident in the future will be investigated fully and accurately, and the cause determined. It will then be more simple for P.I.C.A.O. to take action and bring to the notice of all operators the causes of accidents, so that the same set of circumstances may not be allowed to exist and produce future crashes. One of the important international questions on this subject of accident investigation is the bearing of the cost of the investigation when an aircraft registered in one



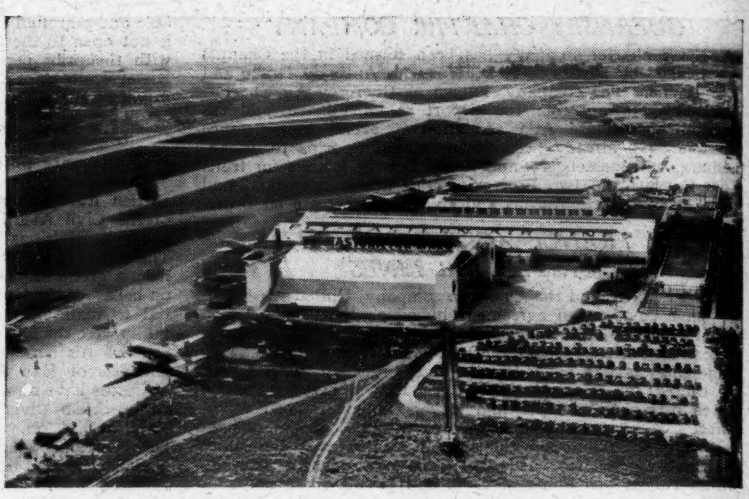
SABENA DOVE: One of the first two of a series of D.H. Doves to be ordered by Sabena, photographed recently on arrival at Haren Airfield, Brussels. They will be used for internal routes in Belgium and on feeder lines in the Belgian Congo.

CIVIL AVIATION NEWS

country meets with an accident within the territory of another. The international aspects of this problem are also being discussed at the meeting.

COLOMBIA TO FLORIDA

AVIANCA, the Colombian affiliate of P.A.W.A., is starting a service between Colombia and the United States, with Miami as the northern terminus. Skymasters, of which the company has four, with two more on order, will be used on this route. The airports at Bogota, the southern terminus, and Barranquilla, at which the only stop is to be made, have recently been enlarged and improved, and it is understood that other Colombian airports are undergoing similar improvements. Avianca is the oldest airline in the Western Hemisphere and operates about 7,000 miles within Colombia. Air-mail services are flown for the Colombian Government, which recently ordered the company to supply feeder services to all airlines operating into the country. The Inter-American Safety Council's award for safety has just been given to Avianca for operating for five consecutive years without a fatality, a very impressive record which compares well with any airline in the world.



PLAYBOYS' TERMINAL: The airport at Miami stands on the eastern routes between North and South America, and is the terminus for many services to the West Indies. The hangar in the foreground has been constructed to withstand wind velocities up to 200 m.p.h.

AIR SERVICES FOR MALAYA

THE Straits Steamship Company of Singapore and the Ocean Steamship Company of Liverpool have jointly formed a company under the name of Malayan Airways, Ltd., which is registered in Singapore. Mr. H. J. C. K. Toms and Mr. R. F. W. Leonard are directors. The company has been negotiating with the Malayan Government to operate regular air services between the principal towns in Malaya, and later to extend these services to British Borneo, Siam and Lower Burma. Aircraft will also be available for private charter. The regular services are expected to start in April of this year with Consul aircraft, which have been specially tropicalized. British Aviation Services, who are agents in the United Kingdom for Malayan Airways, are responsible for delivering these aircraft from the United Kingdom, and the first Consul was due to leave London for Singapore last Friday. Capt. D. W. Fenton, who is delivering this aircraft, will remain in Singapore as technical adviser and operations manager of the new company. It is understood that aircraft with larger payload and with greater range are to be purchased, but the company has not yet decided what types to buy.

AMERICAN FARES INCREASE

UNITED AIR LINES have announced their intention of imposing an excess fare of one cent per mile for passages in their new Douglas DC-6 aircraft, which are expected to start operations within three months. The basic rate on existing aircraft will continue to be 4½ cents per mile. The extra charge is said to have been made for the express nature of the services, and the more luxurious accommodation in the new aircraft. Perhaps it would be a more reasonable explanation that the American companies have found by experience that the deductions that were made in their fares were too drastic, and this is one way of reaching a more economic fare level. It is usually more economical to operate large fast aircraft and the reason for the increase would not appear to hold water.

BREVITIES

PAN AMERICAN AIRWAYS are starting a non-scheduled service between South Africa and the United States. The South African Minister of Transport has said that these flights may be regarded as forerunners of a regular service which it is hoped to introduce between New York and Johannesburg, via the Azores and the west coast of Africa.

* * *

The Silver City Airways' Lancastrian, *City of Canberra*, on a charter flight last week to Johannesburg from the United Kingdom, followed the route through Maiduguri and Leopoldville, where the only night stop was made. The total flying time was twenty-four hours.

* * *

The first charter to be flown by Braathens, of Oslo, was also the first aircraft to leave Palestine with evacuees for the United Kingdom.

* * *

Mr. A. J. R. Murray has left British Overseas Airways Corporation to join Silver City Airways as traffic superintendent.

* * *

Mr. Quentin Roosevelt has been appointed assistant to Mr. Harold M. Bixby, vice-president of Pan American World Airways. Mr. Roosevelt will be responsible for the supervision of all functions undertaken by Pan American on behalf of the China National Aviation Corporation.

* * *

The Association of Supervisory Staffs, Executives and Technicians, the trade union recognized by the three British Corporations, has recently established a National Airways Council under the chairmanship of Mr. Ian Mikado, M.P.

Fifth-freedom rights at Lydda Airport have been granted to Iranian Airways, a subsidiary of T.W.A. The first schedule on the new Palestine-Persia service was flown from Lydda to Teheran on February 1st. The company is using Dakotas with American crews.

Mr. Gilbert G. Minorgan has been appointed station manager for Trans-Canada Air Lines at London Airport.

* * *

The Air Registration Board has re-issued two *Notices to Licensed Aircraft Engineers and to Owners of Civil Aircraft*. One, No. 4, is a list of airscrews approved for use on civil aircraft, in respect of which there are in force certificates of airworthiness. The second *Notice* is a re-issue of No. 11, and concerns airscrews manufactured by the Airscrew Company and fitted to Cirrus Minor aero engines.

* * *

The South Pacific Regional Meeting of P.I.C.A.O. is studying the problems of air navigation in that region. After determining what facilities are at present available for the use of international air transport, recommendations for the provision of additional facilities will be made.

* * *

Since 1942 United Air Lines have conducted, under contract, transport operations for the American Army Air Corps. Seven thousand flights have been made across the Pacific, transporting more than 156,000 military passengers and 17,000 tons of cargo and mail. The aircrews and ground staff are now returning to normal civil operations, and many will be assigned to the company's newly authorized San Francisco-Honolulu route.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

TRAINING COMMAND

Not the Place for Quick Promotion

I SEE from the papers that the R.A.F. says it is short of instructors.

This is not surprising, for Training Command is rightly considered a "dead-end." On my station alone there are corporals, sergeants, and flight-sergeants who have held their present rank for five, six or even seven years despite highest recommendations for promotion.

This fact is aggravated by their own A/C.2 or Cadet trainees returning after a few years in the squadrons, equal or senior to them in rank.

Many Servicemen prefer instructing to squadron life, and would have remained in (or would return to) the Service if the chances of promotion were brighter.

AN INSTRUCTOR.

FLYING JOBS

The Fighter-pilot's Air Sense

I SHOULD like to endorse "Ex-Fighter Boy's" remarks in *Flight*, January 23rd. I remember how after many hundreds of hours on Spitfires and Hurricanes, entailing pilot navigation under all conditions, I transferred to "twins" and was provided with a brand new navigator. Preparing for our first practice cross-country, a simple journey of about 200 miles, I observed with wonder this gentleman enter the "Beau" equipped with a large green bag containing maps, rulers, protractors, course calculators and wind-finding gadgets. Faced with this imposing demonstration of knowledge and skill, I realized that my only duty was to sit back and hold the stick whilst he told me what course to steer and when to turn. After half an hour he announced that he was completely lost. Then, whatever qualities are developed in the pilot of a "single" came to my aid and we got back to base with my faith in green bags and their contents slightly diminished.

I am surprised that it is not more appreciated that the most important qualities of a pilot, which are surely airmanship and "air sense," are *best* developed as the captain of a single-seater. The technical aspects of flying a "multi" are easily learned in comparison with these qualities, which can only be acquired by a lot of flying hours, preferably by yourself.

I'm afraid there is a considerable prejudice against "fighter boys," arising from the suspicion that they are addicted to throwing their machines about and "aerobatting" at the slightest provocation. This notion, if it does exist, is certainly unsound. It is merely a question of flying an aircraft in the manner for which it was designed, and an experienced pilot will do that whether it be a Spitfire or a York. I hope "Ex-Fighter Boy" will find an airline that appreciates the particular qualities of airmanship and self-reliance that flying "Spits" taught him.

R. H. TURLINGTON.

IS THE DAKOTA DANGEROUS?

The R.A.F. Says "No"

THE succession of fatal accidents recently on civil air lines has focused the spotlight of publicity on the Dakota, and it is interesting to look at this aircraft's performance in the R.A.F. Everyone will be familiar with its wartime achievements; it flew regularly over the "Hump," it dropped supplies to our troops in Burma, it ferried troops expeditiously and acted generally as an efficient and reliable maid-of-all-work. The aircraft built a high reputation in all respects, but the current tendency in some quarters is to belittle its efficiency, with the result that the man in the street now regards it as a death-trap.

Some facts about its recent accident record may help to dispel this illusion. It must be understood that they refer only to R.A.F., and not to civil aircraft. However, Transport Command's airline services are of much the same nature as, and are in fact widely compared with, civil airlines. In such airline operations (in which two-thirds of the aircraft engaged are Dakotas) there was only one fatal accident on the type, in which three people were killed, for an effort of 96,500,000 passenger-miles on the aircraft. This, we consider, is an outstanding achievement.

At the present time, Transport Command's Dakotas operate exclusively on Continental routes. There were, it is true, other fatal accidents on supply and support sorties (rice-dropping, for example) but they involved hazards of an operational and emergency nature not normally encountered in peacetime conditions. Even so, taking into account all Dakota accidents in Transport Command in 1946, the accident rate per 10,000 flying hours is surprisingly low.

There is no other twin-engined aircraft engaged in a similar flying rôle which could be used for accurate comparison with the Dakota. It is interesting to note, however, that, for the period January to July, 1946 (the latest for which complete figures are available) the Dakota accident rate is lower than that for the Lancaster, Mosquito, Wellington, Anson, Oxford, and Spitfire, and in fact all the types in general use. Indeed, it is as good as that of the York, which, one would imagine, had a greater safety rating by virtue of its four engines.

It is the practice to classify accidents by stages of flight, e.g., take-off, in flight, landing, etc., and to express these divisions as a percentage of the total number of accidents. Sufficient accident data are now available to enable us to affirm that the incidence of accidents, expressed in such ratios, is now reasonably stabilized from year to year. A breakdown of Dakota accidents on these lines shows that, contrary to the widely voiced opinion that the safety factor is reduced on take-off by over-loading, the take-off percentage is, in fact, lower by one-third than the average figure for all types. This is an excellent record, assuming that R.A.F. loads approximate to those carried by British civil airlines.

The percentages for taxying and stationary accidents are higher than the average, but, generally speaking, these types of accident are caused more by carelessness or inefficiency on the part of personnel rather than by any defect or inherent weakness in the aircraft. In any case, accidents of this nature are not killers.

Such facts enable us to conclude without hesitation that the Dakota is not a dangerous aircraft to fly. On the contrary, it would seem to be one of the safest aircraft in the Service.

F. C. A. CANDER, S/L.
R. A. JEFFERY, F/L.

AIR ACCIDENTS

Exploring Every Avenue

IN view of the alarming number of aircraft accidents in the past few weeks, may I beg a little space to request those in authority to pursue a line of enquiry that—so far as the public knows—has not once been touched upon? It is this.

Commercial pilots are some of the most highly trained, and experienced, men that can be found in any industry, and I do not think there will be found one dissentient to that view.

If that is the fact, can we be sure the administrative staff appreciate it? Is it certain that they bring no pressure to bear on their pilots which *might* give rise to worry, which *might* cause slight confusion of thought, and which—if true—almost certainly *would* bring about an accident?

I put that question to the authorities as a possible cause of *some* of the accidents, for I have been in a pilot's position and feel that there is more in this than meets the public eye, and no avenue of enquiry should be left untouched if it could save a few lives.

F. S. SYMONDSON.

FORTHCOMING EVENTS

Feb. 15th.—Pathfinder Association: Grand Ball, Dorchester Hotel, Park Lane, London, W.1. 8 p.m.

Feb. 15th.—Soc. of Licensed Aircraft Engineers: "Aviation Fuel—A Review," A.Cdre. F. Banks.

Feb. 18th.—R.Ae.S. Bristol: "Radar—Its Uses and Possibilities in Civi Aviation," F. R. Wills (B.O.A.C.).

Feb. 19th.—R.Ae.S. Birmingham: Debate with Coventry branch. 7 p.m.

Feb. 19th.—R.Ae.S. Southampton: "Problems in Fighter Design," R. L. Lickley.

Feb. 20th.—"Aerotech" Flying Club, No. 1. "Pathfinding," W/C M. A. Smith, D.F.C.

Feb. 21st.—Inst. of Physics: "The Organisation of Aircraft Radiology During the War," W. L. Harper (M. of S.), at Burlington House, Piccadilly, 6.30 p.m.

Feb. 22nd.—Helicopter Assoc. of Gt. Britain: "Limitations in Helicopter Design," J. A. J. Bennett, Manson House, Portland Place, W.1. 2.30 p.m

Royal Air Force and Naval Aviation News and Announcements

LIVELY LINCOLN: Though it is the largest aircraft operated by the R.A.F. and has the highest wing-loading, the Avro Lincoln II (Rolls-Royce Merlin 85s) is amazingly agile.

SERVICE AVIATION

Awards

THE KING has been graciously pleased to approve the following awards:—

George Cross

Squadron Leader Hubert Dinwoodie, O.B.E., M.C., R.A.F.V.R., No. 5140 (Bomb Disposal) Squadron.

George Medal

Corporal Roland Norman Garred, B.E.M., R.A.F.V.R., No. 5140 (Bomb Disposal) Squadron.

British Empire Medal

Leading Aircraftman John William Hatton, R.A.F.V.R., No. 5140 (Bomb Disposal) Squadron.

Extracts from the citations follow:—

On August 20th, 1946, German high explosive aircraft bombs were being loaded into vessels at Lubeck for disposal at sea, and two train loads of bombs, weighing approximately 1,100 tons, were drawn into the quayside. Loading into barges was in progress, when a 50 kilogram bomb, fitted with a "tel" fuse, was accidentally dropped a distance of about four feet by the German loading party. The bomb, which was one of a batch of twelve similar bombs being handled at the time, exploded, killing six persons and injuring twelve. There was grave danger that one or more of the eleven bombs involved would detonate and that bombs of a similar construction would function and thus blow up the trains. As a result grave apprehension was felt for the safety of the port. There was nothing to guide a bomb disposal party as to the cause of the detonation.

S/L. Dinwoodie was sent at once to Lubeck to report on the situation and, if possible, to clear the dangerous missiles. He found that the eleven bombs were of an experimental type, fitted with a special shock-sensitive electrically operated fuse. Cpl. Garred was detailed to assist S/L. Dinwoodie to deal with these bombs and to take action to safeguard the munitions trains. Despite the very considerable risk involved, S/L. Dinwoodie and Cpl. Garred proceeded to defuse one of the bombs in an attempt to discover the cause of the explosion. They found that the accident was due to defective German workmanship or design and that, in several of the bombs, the fusing device had already moved, rendering the bombs dangerous. Also, in view of the length of time these bombs had been in storage, the state of the main filling was not above suspicion.

With extreme care, S/L. Dinwoodie, assisted by Cpl. Garred, rendered the eleven bombs safe. From the information obtained by them, it was possible to minimize the danger and clear the trains.

Leading Aircraftman Hatton was detailed to assist S/L. Dinwoodie as motor transport driver during this operation. From the night of August 20th, 1946, until the clearance of the bombs was effected, he performed his duties efficiently and carefully with the full knowledge that he was working by the side of munitions trains in a hazardous condition and adjacent to eleven bombs which were shock-sensitive. When it became necessary to move a damaged rail-wagon, still loaded with the remainder of the bombs, L.A/C. Hatton towed it very carefully along the dockside, until it was manœuvred into the desired position.

British Empire Medal

Leading Aircraftman Thomas Stuart Fernie, R.A.F.V.R., R.A.F. Station, Padang.

On May 14th, 1946, this airman displayed outstanding courage and devotion to duty during an incident in which two men lost their lives. A 250-gallon Japanese petrol bowser caught fire and there was a danger of the fire spreading to adjacent buildings. With complete disregard of his own safety, L.A/C. Fernie entered the driving cab of the blazing tanker and drove it away from the camp, heading it into a hollow morass at a safe distance.

On another occasion, whilst acting as an emergency driver, L.A/C. Fernie's vehicle was ambushed by Indonesian terrorists at a dangerous bend leading to a narrow bridge. A bomb was thrown into the vehicle injuring two passengers. At the same time a machine gun opened fire and three bullets passed through the driving cab within two inches of L.A/C. Fernie's head. In spite of this, he corrected the swerve of the vehicle, negotiated the bend, and brought his vehicle safely to camp.

Vice-Admiral Sir T. Troubridge

THE Admiralty announces the promotion of Rear-Admiral Sir Thomas H. Troubridge, K.C.B., D.S.O., to Vice-Admiral in His Majesty's Fleet, to date January 31, 1947.

Fairey Trainers for Royal Navy

A SUBSTANTIAL order has been placed "at the instance of the Admiralty" for Fairey Operational Trainer aircraft. This type, adapted from the Firefly I fighter-reconnaissance machine, has hitherto been generally known as the "Firefly Trainer." Work on the order has already begun at the Fairey Company's Stockport factory, Heaton Chapel.

Recent photographs and notes appeared in *Flight* of January 23rd.

Accident-free Transport

DURING December, 1946, there were no accidents involving casualties in passenger and troop-carrying aircraft of the R.A.F. About 9,200,000 passenger miles were flown.

Inter-Unit Competitions

A PROPOSAL is being considered to reintroduce the inter-unit flying, bombing, gunnery and efficiency competitions in the R.A.F. These were discontinued in 1939.

Ceylon Malcolm Club

THE first R.A.F. Malcolm Club in Ceylon was opened by Sir John Howard, the officer administering the government, on January 23rd, at R.A.F. Station, Katukurunda. Radio S.E.A.C. broadcast the proceedings. His Excellency was met by A. Cdre. C. E. Chilton, Air Officer Commanding, Ceylon, and Mrs. Ann Adams, deputy area director of Malcolm Clubs, Far East.

Meteor Scores a "Possible"

DURING last year R.A.F. Meteor squadrons did a great deal of air-to-air and air-to-ground firing with their four 20 mm guns. The Meteor proved itself an exceptionally good gun platform and pilots who had not previously fired

(*Continued on page* 180.)

Firebrand Development

ON this page are photographs of six versions of the Blackburn Firebrand, initially designed as a Sabre-powered fighter for the Royal Navy, and now, with Centaurus engine, the standard single-seat strike aircraft of that Service.

Development has culminated in the Mark V, and Firebrand IVs now in service are being modified to Mk. V standard. The main differences between the two Marks are the fitting on the Mk. V of a horn-balanced elevator and new aileron tabs of longer span. For these improvements Mr. W. S. Farren, C.B., M.B.E., M.A., F.R.S., M.I.Mech.E., F.R.Ae.A., Blackburn's technical director, has been largely responsible. Provisional approval has been given for a weight of 17,500 lb and detail improvements have been made, including the fitting of an automatic "window" distributor, alterations to the RATOG jettisoning gear and the adoption of a negative-g oil tank. Minor alterations have been made to the air intake in the port leading-edge. Approval has been given for two 45-gallon tanks, or one larger tank, on the torpedo carrier, as an alternative to which bombs may be carried as an overload. No A.S.V. is fitted.

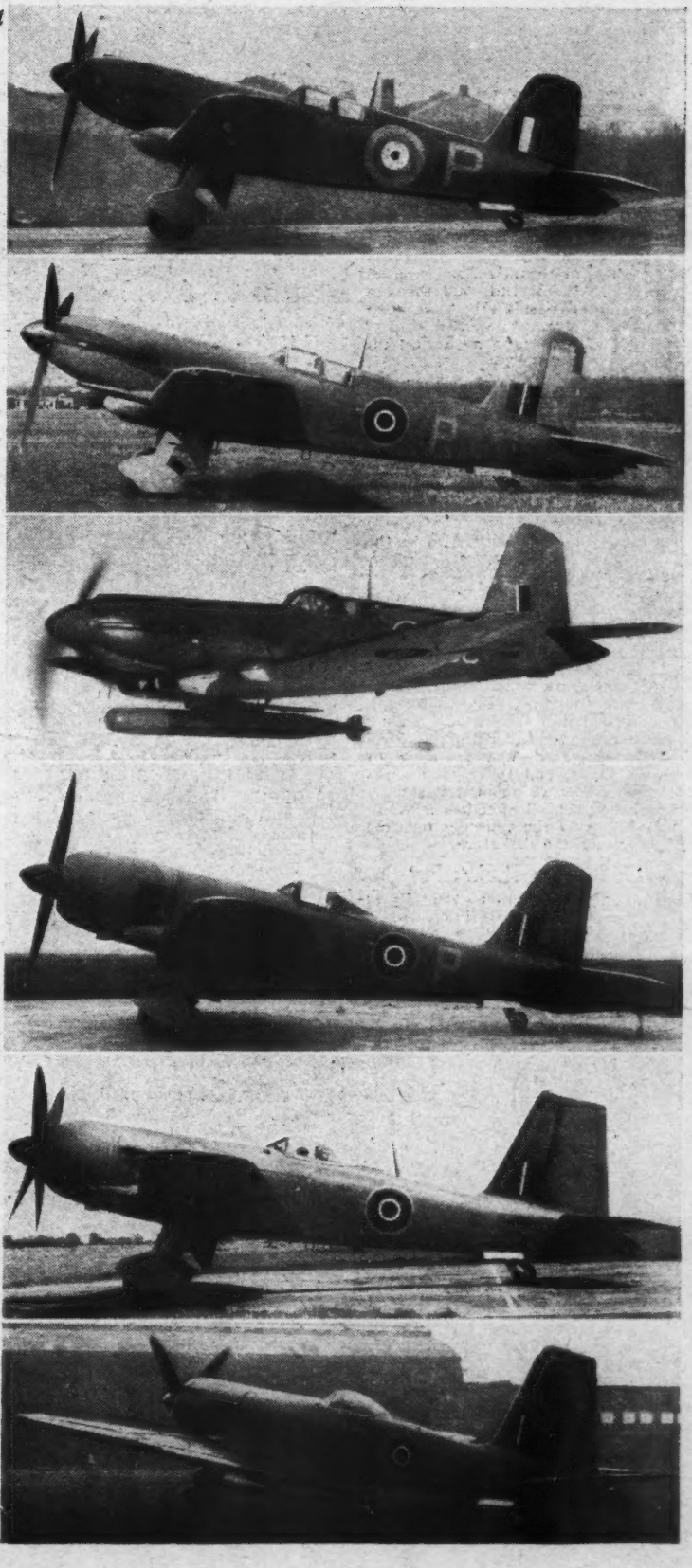
Preceding Firebrand development is of interest. The Firebrand Naval fighter was designed round the Napier Sabre engine, but as production of this unit was required for Typhoons, and in view of the fact that the Seafire amply met the Navy's immediate need for a fighter, it was decided to redesign for a Bristol Centaurus radial and to develop the Firebrand as a "strike" aircraft. As a matter of history the first Firebrand prototype flew, without military equipment, on February 27th, 1942, and the first F. Mk. I commenced flight trials five months later.

Equipped as a torpedo-carrier, the T.F. Mk. II, which first flew on March 31st, 1943, had a slightly greater span. At first the torpedo gear was fixed, but later the "two-position" type was adopted.

First of the Firebrands to have the Bristol Centaurus radial engine, the T.F. Mk. III likewise had the two-position torpedo gear, permitting adequate ground clearance and good high-speed release characteristics. This model flew on December 21st, 1943, but was found to be unsatisfactory for deck flying, as the rudder was too small to give sufficient control at take-off.

The well-known T.F. Mk. IV, with Bristol Centaurus IX (first flight, May 17th, 1945), was really the production version of the Mk. III, with larger vertical surfaces and provision for dive-brakes. This first flew on May 17th, 1945.

Flying at a weight of 16,000 lb and carrying a torpedo the Firebrand T.F. Mk. V achieves 342 m.p.h. at 13,000ft; without torpedo 350 m.p.h. is attainable. With 239 gallons of fuel and using 75 per cent power the range is 745 miles.



FIREBRAND FAMILY: Six versions of the Blackburn Firebrand, some notes concerning which appear on this page. Reading down, these are the first prototype, Mk. I series prototype, Mk. II, Mk. III, Mk. IV, and the latest Mk. V. Note the horn-balanced elevator on the Mk. V.

SERVICE AVIATION

(*Continued from page* 178)

at towed targets obtained above-average results. W/O. Oxford, of No. 245 Sqn., registered 100 per cent hits with 160 rounds, and other Meteor pilots recorded 91 and 83 per cent.

Launch of H.M.S. "Centaur"

DURING April the Duchess of Kent will launch the aircraft carrier *Centaur*, first of the new *Hermes* class. Harland and Wolff, Ltd. laid the keel of *Centaur* at Belfast nearly three years ago. H.M.S. *Bulwark*, another ship of the class, will be launched during the year.

Battle of Britain—Roll of Honour

THE names of about 1,500 members of the Allied flying forces who lost their lives as the result of fighting in the Battle of Britain will be inscribed in an illuminated Roll of Honour to be deposited in the R.A.F. Memorial Chapel in Westminster Abbey.

The work of Miss Daisy Alcock, the Roll will have about 150 pages, measuring 20×15½ inches.

Helicopter on "Vanguard"

AFTER flying through a snowstorm, a Sikorsky helicopter, piloted by Lt. K. M. Reed, and carrying Lt. Cdr. R. Parkinson as passenger, touched down safely on the deck of H.M.S. *Vanguard* as she headed into the Channel on her voyage to South Africa bearing the Royal Family. *Vanguard* was steaming at about 15 knots, and the Sikorsky was set down in a space about 30ft square. The machine took off after five minutes, and Her Majesty the Queen is reported to have filmed the departure.

DC4-Ms for R.C.A.F.?

IT is understood that the Royal Canadian Air Force is interested in the possibilities of the DC-4M transport aircraft, fitted with four Rolls-Royce Merlins. This type has a performance greatly superior to that of the standard commercial DC-4.

The Peacetime R.C.A.F.

IN the first full year of peace, the Canadian Department of National Defence for Air was occupied with the task of creating a relatively small, permanent, regular Air Force while dismantling the huge organization built up under pressure of war. For all practical purposes, demobilization of the wartime R.C.A.F. was completed during the year, 53,731 taking their discharge in 1946. This total included members of the women's division, who were released by December 21st.

Hand in hand with demobilization went the work of repatriation. The bulk of the R.C.A.F. units overseas had returned to Canada by the outset of this year, with the exception of the Canadian squadrons in the forces of Occupation, three transport squadrons still operating within the R.A.F. and the staff engaged in clearing up administrative details in Britain. All personnel of the transport squadrons and the occupational forces were back in Canada by the end of June, raising the 1946 repatriation totals to 18,442.

Winter Tests in Canada

FIFTEEN officers and N.C.O.s of R.A.F. Transport Command have flown in a York to the Winter Experimental Station of the Royal Canadian Air Force at Namao, near Edmonton, Alberta. They are seeking experience in the flying and servicing of aircraft in low temperatures.

At this time of year, temperature at Namao is always well below freezing point, and 17 degrees of frost at night is common. For three weeks the members of the mission will live, work and fly under Arctic conditions. They will return with a report on the reactions of men, aircraft and engines.

Before leaving the U.K., the men were taught how to combat the effects of intense cold, such as frost-bite and snow blindness, and equipped with special winter clothing.

As they come from different stations they will be able to spread the results of their experience throughout Transport Command. The York and its Merlins have been specially prepared for the intense cold.

Led by S/L. D. Iveson, D.S.O., D.F.C., the party will return towards the end of February.

R.A.F. and W.A.A.F. Efficiency Awards

THE Air Efficiency Award is now available to members of the W.A.A.F. who began their service in the Force before September 4th, 1939. Embodied service in the Auxiliary Air Force and the W.A.A.F., and mobilized service in the R.A.F.V.R. now counts at double the peacetime rate for the purpose of calculating qualifying service.

The Air Efficiency Award was instituted in September, 1942, for long and meritorious service in the Auxiliary and Volunteer Air Forces of the Empire, the main qualification being ten years' efficient service. The ribbon is dark green with two narrow central stripes of pale blue.

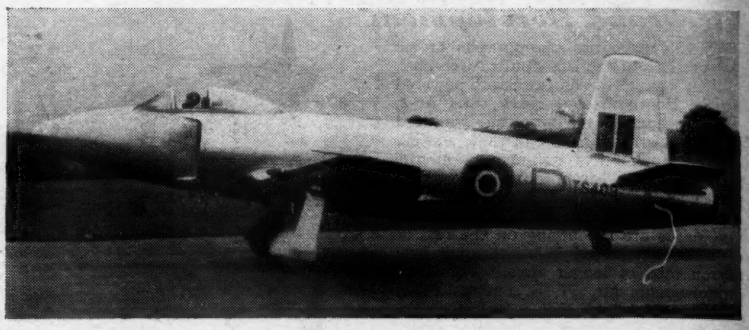
Former members of the Territorial Army who were on the active list of that force on September 2, 1939, and were later transferred to the R.A.F. are now eligible for the Efficiency Medal. The qualifying period is twelve years, but embodied service since September 3, 1939, including R.A.F. service, counts double. The ribbon of the medal is dark green with a narrow yellow stripe at each end.

Reunions

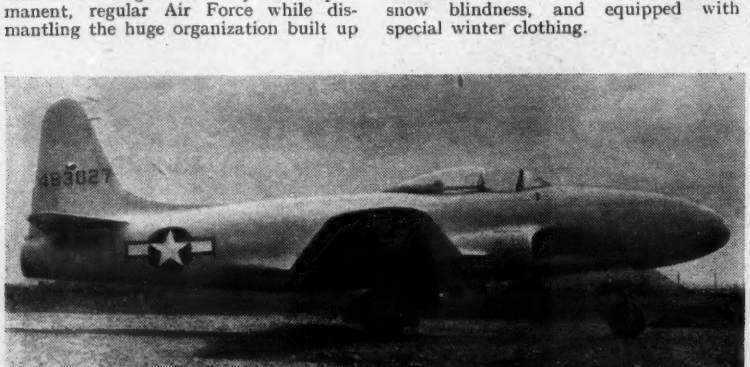
MEMBERS of No. 138 Wing, No. 2 Group, and of its former squadrons (Nos. 613, 107 and 305 (Polish)) propose to form a Reunion Dinner Club, in the first instance for officers. A committee has been formed, and ex-members interested should contact E. J. Hussey, 235, Elmsleigh Drive, Leigh-on-Sea, Essex, with names and addresses of other ex-members with whom they are in contact. The next meeting is on February 22nd, in the Holborn Empire Buffet, at 7.30 p.m.

The late C.O. is G/C. W. W. C. Bower, D.S.O., D.F.C., now at Air Ministry, D.D.P.S.1.

All ranks of 221 Sqn. are invited to a reunion party at Ye Mecca Café, 21, St. Mary Axe, E.C.4, on Saturday, March 1st, at 7 p.m. Full particulars from W/C. T. R. Vickers, Old Mill Cottage, Rushden, Buntingford, Herts.



STUDY IN BREATHING—I: The Supermarine E.10/44 fighter with Rolls-Royce Nene turbine-jet. Intakes are of the "elephant ear" type.



STUDY IN BREATHING—II: This view of a Lockheed Shooting Star in which a Rolls-Royce Nene was first installed, may be compared directly with that of the "E10."

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